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SAWYER-MAN ELECTRIC CO.,

COMMERCIAL AGENT OF THE CONSOLIDATED ELECTRIC LIGHT CO.

No. 510 West 23d Street, New York,

August 1st, 1888.

To all Users of Incandescent Lamps:

Experience has demonstrated that the life and utility of the Incandescent Electric Lamp is increased and the cost of its manufacture diminished by a decrease of the electromotive force. We have, therefore, decided to divide our commercial lamps into three classes, viz: HIGH, MEDIUM, AND LOW VOLTAGE LAMPS; of which classes, 100, 75, and 50 volts, respectively, shall stand as the types.

THIS COMPANY, THE FIRST TO GIVE TO THE CONSUMER THE BENEFIT OF SUCH CLASSIFICATION, IS ENABLED, BY REASON OF INCREASED MANUFACTURING FACILITIES, AFFORDED BY THE ENLARGEMENT OF OUR NEW YORK AND PITTSBURGH FACTORIES, AND BY REASON OF VALUABLE IMPROVEMENTS MADE IN THE LAMP, TO OFFER THE FOLLOWING REDUCTION IN PRICES FOR LAMPS WITH OUR

STANDARD BASES

SUBJECT TO DISCOUNTS FOR CENTRAL STATION USE AND TO PURCHASERS OF ORIGINAL PACKAGES OF 250 EACH.

C. P.	50 Volt.	75 Volt.	100 Volt.
16, and under,	$0.70	$0.75	$0.80
20,	.75	.80	.85
24,	.80	.85	.90
32,	.90	.95	1.00

THREE CENTS WILL BE PAID FOR THE RETURN OF EVERY LAMP BASE WITH THE PLATINUM WIRE INTACT, DELIVERED IN GOOD ORDER AT EITHER OF OUR FACTORIES.

For the purpose of obtaining uniformity of production, and of reducing the cost of manufacture, we offer to purchasers of our lamps our Standard Sockets, without charge, in exchange for any other socket in use by them.

CORRESPONDENCE SOLICITED.

SAWYER-MAN ELECTRIC COMPANY.

ELECTRICAL REVIEW

ILLUSTRATED.

A WEEKLY JOURNAL OF

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The Good Lightning Rods.

The article entitled "The Lightning Rod Myth," which originally appeared in the Philadelphia *Record* and which was republished in the ELECTRICAL REVIEW in a recent issue, has produced considerable discussion in electrical circles South. An electrician of Birmingham, Mr. T. U. Patee, writes the following communication to a paper of that place which will be read with interest by many of the readers of this paper. Mr. Patee says:

Under the above heading you publish an article taken from the Philadelphia *Record*, in which a Mr. Walker asserts that lightning rods are losing their place in the public confidence and are fast going out of use. In Philadelphia, where he lives, there is one factory—Reyburn, Hunter & Co's.,—which alone now makes as much rod yearly as was made by all the factories together fifteen years ago. The same may be said of another great factory—Cole Bros., Greencastle, Ind., —the use of lightning rods being steadily on the increase.

He also says they attract lightning, which is not the case. In accordance with the laws which govern electric action—laws which are well understood by all electricians—they usually prevent an electric accumulation of an intensity sufficient to produce a disruptive discharge. Such a discharge is almost impossible above a well-rodded building, the rod being a passive but most efficient agent between the positive and negative forces which attract each other.

Mr. Walker says iron rusts off in the ground and will attract a force which it cannot discharge. A rod in that condition would present no stronger attraction than the finals, crestings, gutterings, metal roofs, etc., in common use, and which have no means of discharge except through the walls of the building. Call a piece of metal a "broken lightning rod" and it becomes a source of alarm; form the same metal into cresting or cornice and it brings no thought of danger.

However, the rods now in common use are made of galvanized steel or copper and are not open to the objection. Lightning rods and fixtures have now been brought to that degree of perfection that enables manufacturers to guarantee five years' protection to buildings when rodded according to the code of rules established by the delegates to the London Conference of Electricians and Scientists in 1882. Said delegates being sent by the Meteorological Society, Royal Institute of British Architects, Society of Telegraph Engineers and of Electricians and the Physical Society.

These delegates met from time to time for a period of four years, and left no means untried to procure all the information possible relating to the utility and proper application of lightning rods. They discovered that for sixty years lightning-rods have afforded absolute protection to the British navy, while during the fifteen years previous to their application it sustained a loss of 300 sailors and seventy-two vessels. And, after the most thorough investigation, they affirm that: "There is no authentic case on record where a properly constructed conductor failed to do its duty."

Additional orders for lamps will enable the people of Princeton, N. J., to enjoy the benefits of electric illumination.

Following is the Bell Telephone statement showing the output for the month ending July 20: Gross output, 4,485, increase, 140; returned, 2,010, decrease, 1,186; net output, 2,475, increase, 1,326. Since December 21: Gross output, 34,046, increase, 1,038; returned, 12,886, decrease, 1,424; net output, 21,160, increase, 2,462.

A SPLENDID TELEPHONE SYSTEM.

GREAT IMPROVEMENTS IN THE PLANT AND TELEPHONE SERVICE IN BROOKLYN, N. Y.

The New York and New Jersey Telephone Company have purchased a handsome building, No. 16 Smith street, Brooklyn, near the City Hall, into which they have been diverting their underground wires for some time, and during the present month have removed the operating room from the old office, 397 Fulton street, to the new one, which has been equipped with the single cord multiple switchboard. The office is unique in being the only one in the country where all the wires have been brought in entirely underground, and there are no fixtures of any kind on the roof.

The underground work in Brooklyn has been described in detail before, and consists of creosoted wooden conduits with ducts two and three inches in diameter and laid in banks of from four to thirty-six as they approach the office.

In front of the office, where all the ducts concentrate, a tunnel has been built from the cellar across to the further side of Smith street, and an ingenious frame work with rollers allows the cables to be drawn into the office terminals without the necessity of splicing or re-handling at the angle of the street and the building wall. From this point the cables are conducted through iron pipes through an air-tight wooden door, which, when closed, effectually prevents the admission of gas to the building. The iron pipes, when empty, are kept tightly plugged, and when the cables are drawn in, the space between the cables and the pipe is packed gas-tight. A large ventilating shaft is placed just inside the wooden door, and carries off any accumulation of gas and foul air. The result of these precautions is that the building is entirely free from bad smell, and no explosions have occurred anywhere.

Brooklyn now prides itself on having the best equipped all-round central office in the country. There are many that have equal facilities in the switchboard and operating-room, but none where so perfect an underground system is combined with it.

The number of stations in Brooklyn July 1, 1888, was 3,581, embraced in the following offices, which are located to bring all subscribers within a mile of each central office:

Brooklyn.....	1,585	subscribers.
Williamsburgh...	1,076	"
Bedford.....	405	"
Greenpoint.....	263	"
South.....	133	"
East New York..	87	"
Flatbush.....	32	"
Total.....	3,581	"

The Company purchased a lot and erected their own building at Williamsburgh during the last year, and other property will doubtless be purchased for the other offices as the underground service reaches them.

The way in which the underground work has been carried on in Brooklyn certainly reflects credit on the staff, and it will pay any

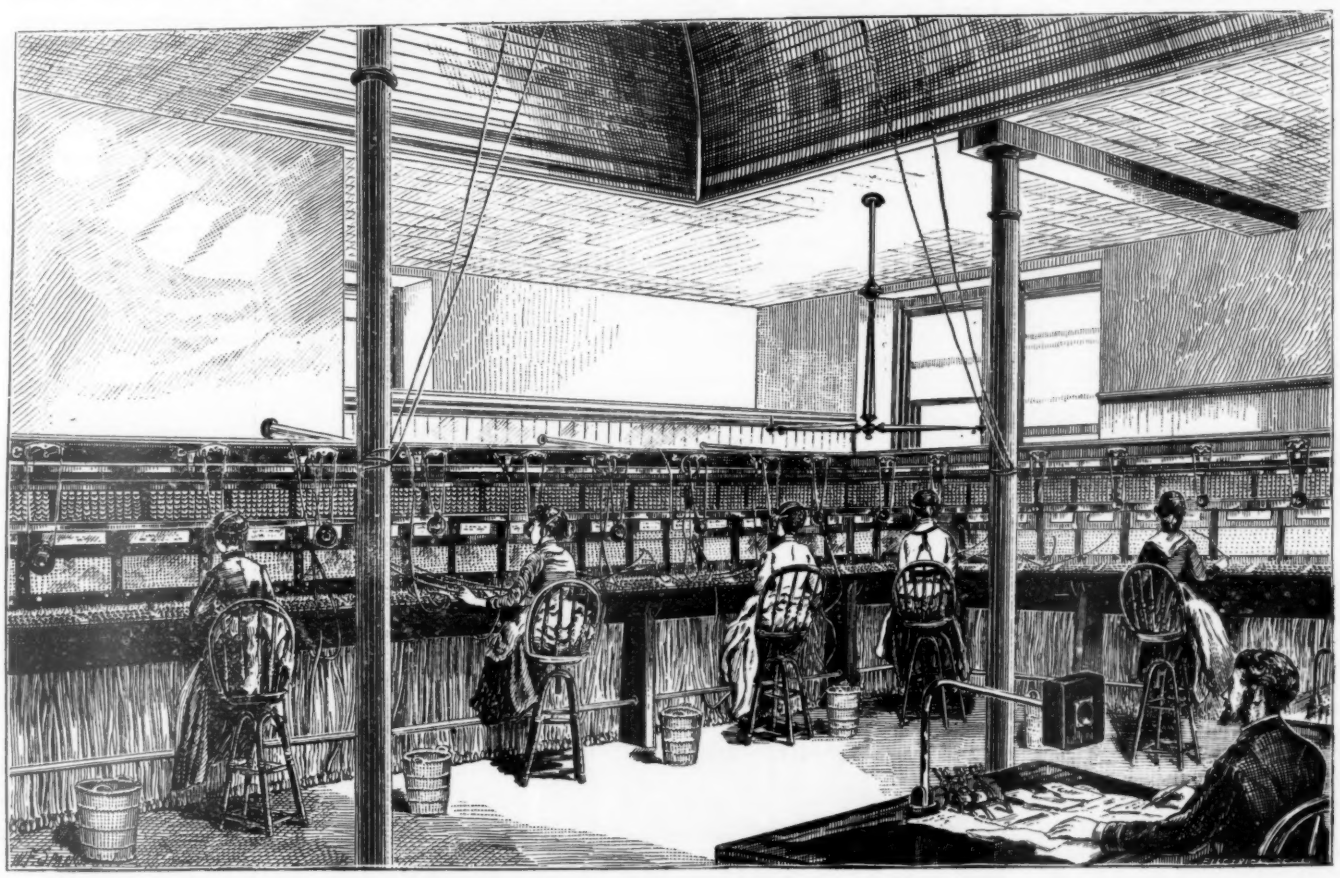


FIG. 1.—THE NEW BROOKLYN TELEPHONE EXCHANGE, NEW YORK AND NEW JERSEY COMPANY, NO. 16 SMITH STREET. VIEW AT LUNCH HOUR WHEN FORCE IS REDUCED.

one interested in underground work to examine into it. The arrangements for bringing the cables into the building, and the convenient and admirable system of distributing wires between the underground and switchboard cables are well worth study.

The company feel that the durability of the creosoted wood for conduits is thoroughly established, and their method of construction permits the handling of cables easily, both in drawing in and hauling out. The increased size of conductors and insulation and the necessity for metallic circuits to remove cross-talk and perfect the service, has made it necessary to increase the size of the ducts to three inches on all new work, and makes the old plans totally inadequate to the volume of business.

The company have recently made contracts with the elevated railroads for placing cables on their structure, and in spite of its being more expensive, they intend to utilize them to the fullest extent, in order to avoid the necessity of tearing up the streets and interrupting traffic.

During the year 1888 over 1,500 miles of overhead wire will be taken down, 500 poles dismantled of telephone wires, but no poles can be taken down until the city provides for its wires to go underground. There are at present 2,100 miles of wire placed in the conduits, one-half of which is in actual service, and during the next six months as much more will be put down and put into service. 1,600 subscribers are working on wires underground.

The transfer of 1,600 subscribers from one building through underground wires to another building where a new and improved switchboard had been placed, but which the operators were necessarily unfamiliar with, was a complicated and difficult task. Yet the change was made with scarcely any interruption to the service, and many of the subscribers were not aware of the change. The operators are becoming familiar with the switchboard and the service is much improved. Connections are made with far more speed than was ever possible under the old system. The multiple switchboard which has been introduced under a contract with the Western Electric Company, is the result of years of patient work, invention, and improvement, of the apparatus for carrying out the fundamental principle of an ideal switchboard, which enables one operator to answer the calls of a certain group or number of subscribers—usually 100—and make with her own hands connection to any other subscriber in the system, whatever the number may be. Or, in case the subscriber asked for is busy, that is, talking to some one else, she is able to ascertain that fact automatically and instantly, and report accordingly.

From the appearance of the present apparatus, every detail has been well designed for the object to be attained, and shows evidence that the best of material and labor has been expended upon it. To the layman it appears as a beautiful specimen of cabinet and machine work on the outside, almost luxurious, in fact; and in the rear, a perfect maze of wires, spring-jacks, annunciators, keyboards, and other paraphernalia, bewildering in their number and intricacy, yet all are, in competent hands, tuned to respond to the reasonable and unreasonable demands of many thousand subscribers, with many thousand degrees of temper.

Mr. Charles F. Cutler is the president, Mr. Joel. C. Clark, secretary and treasurer, William D. Sargent, general manager, and J. C. Reilly, superintendent. Too much credit and praise cannot be given to the indefatigable Sargent and his able co-worker Reilly for the excellent service attained and improvements in the plant.

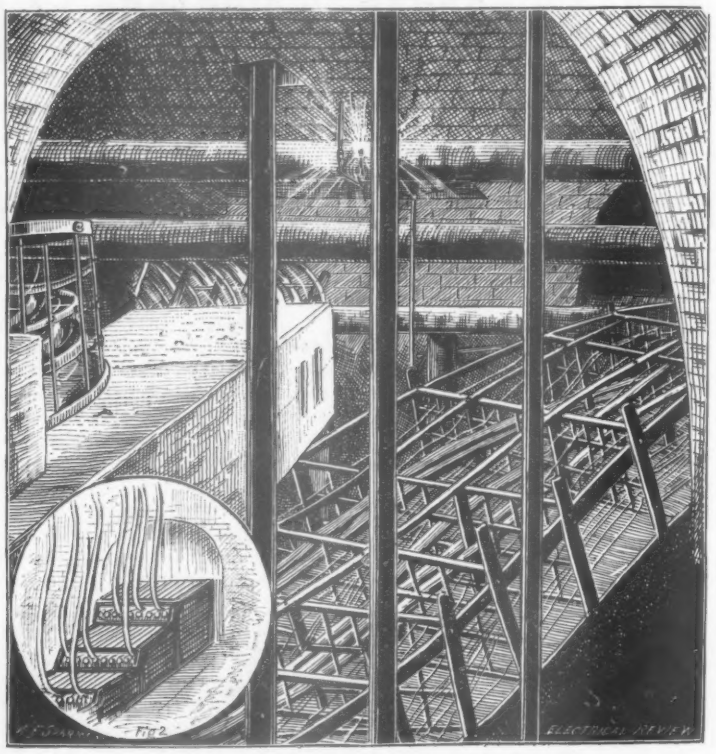
Mr. John R. Burdick, the well-known expert and contractor, will be heard from in the future as the representative for the West of the Callender Insulating and Water-proofing Company, manufacturers of insulated wires and cables, with headquarters located at Chicago. Colonel Burdick has many warm friends in Western cities among the electrical fraternity, and the Callender Company are to be congratulated upon securing the services of a gentleman so popular.

OUR LONDON LETTER.

(Special Correspondence.)

ELECTRIC TRACTION FOR THE UNDERGROUND RAILWAY.

I stated in a former letter that the directors of the two underground railways had decided to make an experiment with a view to adopting electric locomotives on their lines. It has now been arranged that about October next a 600 horse power locomotive shall take its place with the others in the run in a circle an electric locomotive would be useless, unless it was able to run all the way round. To fit all the line with conductors at the present high price of copper would carry the matter beyond the limits of an experiment. The Metropolitan Railway Co. is making an extension to Pinner and Chesham, and if electric traction is found to be successful, the steam engines now used on the underground portion of the line will be transferred to the extension.



FIGS. 2 AND 3.—END OF TUNNEL, SHOWING CABLE AND CONDUIT TERMINALS.—VIEW UNDER STREET OF THE THREE CONDUITS AS BROUGHT INTO THE CELLAR.

ten-minutes circular train service. It is to draw with it accumulators capable of developing the power required for a run of about 28 miles, and a charging plant is to be provided at the Edgmore Road Station. There are to be three motors on the engine, each independent of the others, so that in the event of one of them breaking down, the others would have sufficient power to start the train and move it out of the way. This has been considered necessary owing to the heavy traffic on the line, over many parts of which the trains follow one another at intervals of three minutes.

The experiments will be watched with keen interest by electrical engineers, but though they may show that it is possible to drag along 100 tons of lead with the train, this is not likely to prove at all an economical way of providing the current. Probably overhead conductors would have been tried instead, had it been possible to fit only a small portion of the line, but as the trains

EDISON'S PHONOGRAPH.

Considerable interest was awakened with regard to the new phonograph by a letter which appeared in the daily papers, last week, from Colonel Gouraud, stating that he had received an instrument and several phonograms from Mr. Edison, which reproduced his friend's voice so distinctly that a child of seven years old was able to recognize it with ease. The *Spectator* publishes a long article speculating on the future of this wonderful invention. "In the

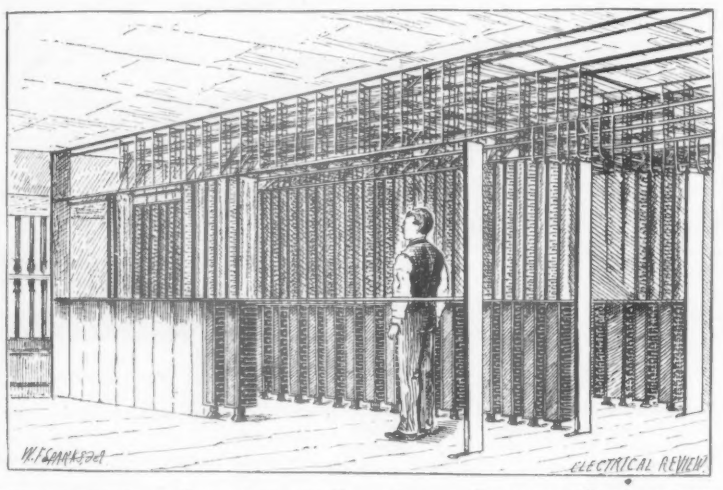


FIG. 4.—BASEMENT ROOM SHOWING UNDERGROUND TERMINALS ENTERING FROM CELLAR BENEATH, WITH STRONG CURRENT PROTECTORS, CROSS-CONNECTING RACKS AND WIRES.

twentieth or thirtieth century," it says, "we shall have Tennyson reciting 'Maud' with that rich and peculiar burr with which he pours it forth to his intimates." Then we are to have voice galleries instead of picture galleries in our houses, in which ancestors of political fame will electrify the hearers as of old. But without going quite so far ahead, it justly points out that the phonograph will be a great boon to the blind, who will be able to listen to books without the assistance of a reader. The statement that the instrument is now being manufactured on a commercial scale in New Jersey leads us to hope that we shall soon be able to test its efficiency for ourselves. Seeing, or in this case oddly enough hearing, will be believing, with the British public.

INCANDESCENT LAMP PATENTS.

The experiments made to aid the judge in deciding the case between the Edison-Swan Co. and the Brush corporation have been completed. Prof. Stokes' report shows that the plaintiff's experimenters were quite successful in making lamps in which the filaments were formed of baked lamp-black putty, but as half the lamps made in this way were "killed" by a 32 hours run, they could hardly be called a commercial success.

The case was re-opened on Monday last, and Mr. Justice Kay was so firm in cutting short the speeches of counsel, that the proceedings are now practically at an end, and we have only to await the judgment which was reserved for further consideration.

TELEPHONE NEWS.

The United Telephone Co. sent a deputation to the Postmaster General a short time ago, asking him to support their bill for granting them greater powers for running overhead wires than they at present possess, but they met with a refusal which was quite decided. They have therefore been obliged to drop the bill for this Session of Parliament.

Mr. Raikes in replying to Mr. Forbes, the chairman of the Telephone Co., said that it would be impossible for the government to grant powers for running overhead wires to a private company, which the post office itself did not possess, and that any concessions made to the London Company, could not be refused to the promoters of provincial exchanges.

It is most undesirable that the telephonic communication of the country should be in the hands of a number of separate companies, but it would also be unfair to grant a monopoly to any one private company. The government will therefore probably take over the telephone business of the whole country in the not very distant future, as it did the telegraphs. The telephone naturally comes into close competition with the vested interests of the post office, and the only way to avoid the difficulty is to buy it up. In any case, it is much to be wished that the government would make a clear statement as to their intentions, as at present the provincial companies hesitate to put up trunk lines at the risk of having them bought up at a valuation just when they begin to pay. The demand for efficient means of communication is in excess of the supply, and as is so often the case in England, this state of things remains unremedied, not from technical but from legal difficulties.

GLASGOW EXHIBITION.

The exhibition which was opened at Glasgow at the beginning of May has proved a distinct success as a display of the manufactures of Scotland, but contains little of special interest to electricians. The buildings, which cover 14 acres, and 66 acres of garden, are lit almost entirely by arc lamps, but the refreshment rooms and other small spaces are shared by glow lamps, Welsbach gas burners and Defries' safety oil lamps.

The arc lighting has been carried out by the Brush corporation who have fixed over 500 2,000 candle power lamps. The gardens are lit by groups of three lamps on the top of wrought iron poles 65 feet high; the leads and the lines for raising or lowering the lamps are carried up inside the poles. The general effect is good, but the space is too large to be satisfactorily lit by the number of lamps employed. All the lights are run by direct current machines, but there are one or two exhibits of transformers, one of which works the welding apparatus introduced by the Thomson-Houston Co.

London, July 6th, 1888.

The city council of Trenton, N. J., are receiving petitions for more electric light lamps.

The New Works of the Daft Electric Light Company, Marion, N. J.

Between eight and nine years ago the Daft Electric Light Company commenced manufacturing at Greenville, N. J., in the building which until the current year has been its sole base of operation. Its field was a new one, almost unexploited and commercially unrecognized, and the force employed was in consonance with these conditions. As time passed, with the ups and downs inseparable from such enterprises, severe and unremitting toil evolved such results as the technical trial at Saratoga; the commercial successes of the electrical transmission of power in New York and Boston; of electrical railway propulsion in Baltimore, Los Angeles, Cal.; Mansfield, Ohio; and other places; each bringing its own reward in the shape of orders for similar work, while the scope and force of the establishment grew commensurately.

The spring of 1888 found Greenville, hopelessly outgrown besides being handicapped with many disabilities which, though of little or no importance in the day of small things, had developed under the new conditions into matters of serious consideration. A move was imperative, and after due deliberation the large building of iron and glass, familiar to travellers on the Pennsylvania Railway, situated on the South side of the track and about six or seven minutes from the Jersey City station, was purchased by the company and immediate possession taken. An illustration supplements this discription of it, which is, however, disappointingly incomplete, as it gives no hint of a three-story brick wing in the rear of even greater size than the main building. A clear conception of its magnitude may be derived from the statement that there are altogether about one and a half acres of floor space in the works and ample accommodation for fifteen hundred operatives.

It stands in a plot of very nearly two and a half acres, and is surrounded by a substantial iron fence and the front adorned by a handsome, though at present somewhat neglected, stretch of lawn and shrubbery. A standard guage track for the testing of electrical tram, and other, cars and railway motors, extends from the car-shops, which open to the West, along the front of the building, the conducting wires being sustained by artistic iron poles which would win the approval of Ruskin or Eastlake, and six handsome gateways give admission to the place. Preparations are also being made to introduce a siding from the Pennsylvania Railway at some convenient point of the grounds.

The building is occupied, as follows: The ample and well lighted paved basement seems comparatively vacant, although it contains an extraordinarily large store and stock room, a brass foundry of considerable size, a blacksmith shop of no mean dimension and an engine and boiler room. The steam-plant is only what was found in the building on taking possession and will be largely increased at an early date. At present it consists of a single direct-acting engine, built by the Putnam Machine Company, developing 75 horse-power at 70 revolutions, and transmitting its power to the shop-shafting by a fly-wheel of 10 feet diameter and a belt of 18 inches width. The boilers are of the Harrison globular type, with four furnaces and an aggregate grate surface of 100 square feet and carry an average steam pressure 110 lbs. to the square inch. Just in front of the engine and boiler room is another whose size is made more conspicuous by a solitary dynamo-generator, a range of counter-shafting and the mechanism of the elevator, bolted to the ceiling—at present the only tenants of the space. This elevator has a lift of four stories, a platform about eight feet square and a hoisting capacity of five tons.

Passing through the principal entrance to the building on the ground floor, an ample vestibule is first encountered, on the right of which is a reception room, also used as a private office by the superintendent, and on the right are his business offices equipped with high desks, gigantic safe, and long distance telephone, in the most gnostic style. Crossing the vestibule and turning to the left, a carpenter shop is found to have possession of the east wing of the iron building, something more than balancing the, as yet, vacant west wing waiting for some indeterminate occupancy, probably a machine shop. Directly to the rear of the vestibule stretches a vast room containing a few—soon it will be many—machine tools; and on the right hand of this is the roomy car shop with tracks over the floor and pits over which the cars roll, so that the mechanics who have to do with them can work at the bottom of a car standing as erectly and with as great facility and convenience as at any other part of it.

On the second floor, the front of the central building is given up to two rooms, one large and one small. The former, on the west side, is the electrical test room for armatures and spools, which are examined as to their insulation and conductivity—and the finished dynamos and motors—the former of which must pass inspection as to their insulation and current-generating capacity, and the latter as to insulation and speed. The small room on the east is the calibrating room where the delicate, standard instruments are kept. These are never removed and their only office is to verify the correctness of the simpler and ruder working instruments—the exigencies of whose service occasionally impairs their reliability—as may be found necessary from time to time. The east wing of this floor is devoted to spool-winding, and cylindrical and elliptical types ranging from half-horse to 250 horse-power machines may be seen in all stages of progress. The west wing is used as an assembling shop and into it come the component parts—fields, spools, armatures, brush-holders, etc.,—to go out as finished dynamos and motors. The balance of the floor will be devoted to general machine shops.

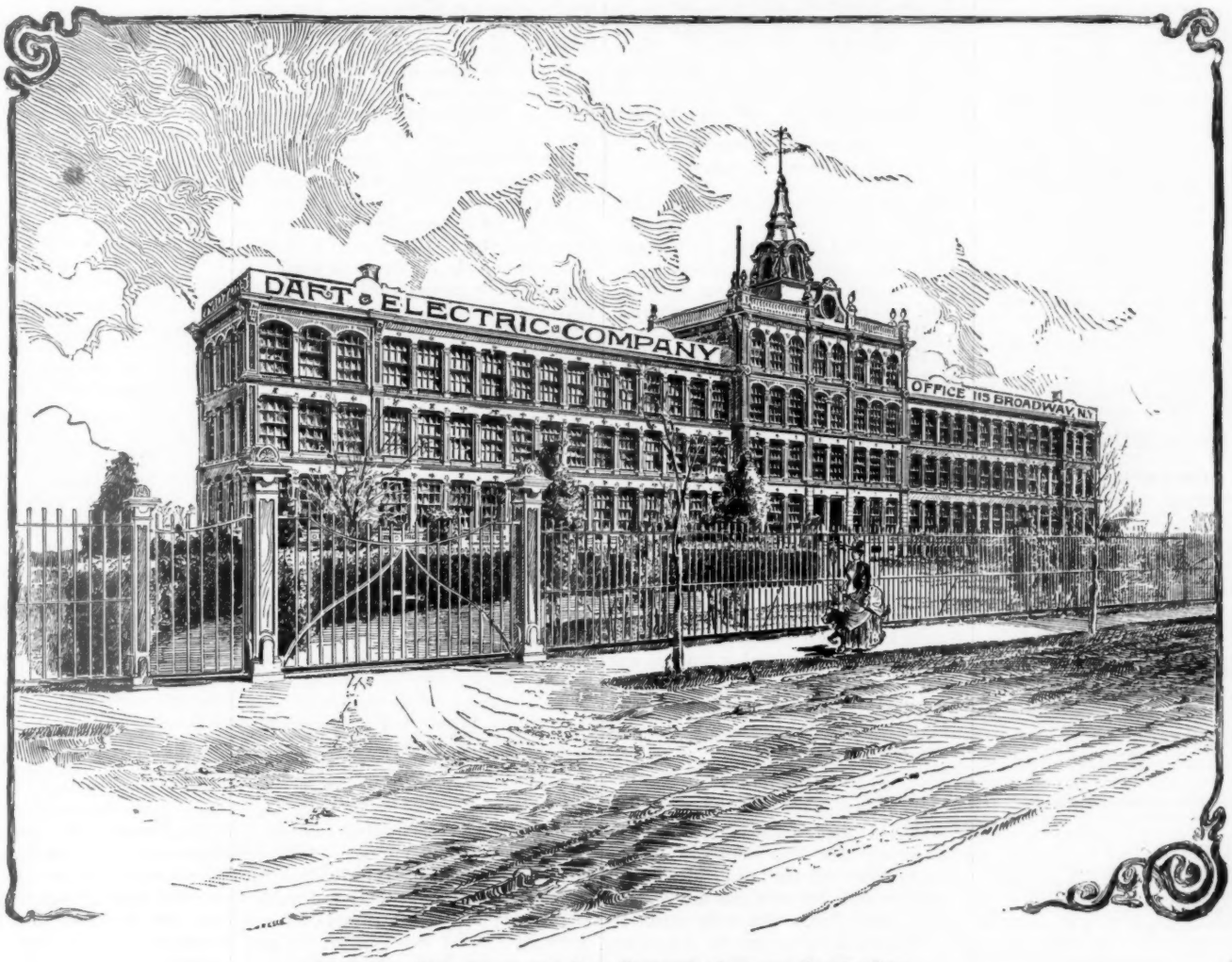
One story higher, and opening from the staircase hall to the north is the instrument room, where various appliances for the safe and intelligent use of electrical current for power purposes are built. The range of work in this department is very great, extending from the minute to the massive. The east wing is the drawing room, with many tables rustling with Bristol boards, tracing cloth, and blue prints, and the west, the armature winding room where examples of work exist in all stages, from the toy-like half-horse motor armature to that of the giant 250 horse power dynamo, which is the present limit of size in this branch of manufacture. The rest of the space on this floor is devoted to machine shops, which do not differ from the general type of such places.

The fourth floor is occupied by the electrician's office, which fitly crowns the building. An ante-room, presided over by Mr. Daft's secretary, and an inner one, where he himself may be found, absorb the entire space on this floor.

While the place is not yet organized, as much of the plant is still detained at the old Greenville works employed on unfilled orders, it is nevertheless a most interesting sight, and reveals enough to an experienced eye to make plain what it will be when the 1,500 operatives, for which it has ample accommodation, shall be all at work, and with the present rapidly awakening interest in electrical street railways and transmission of power, this may be looked for at no distant day.

The location of the works is quite an advantage, and it was a stroke of business genius that led to its purchase by the Daft Electric Company. Close to one of the greatest avenue of travel in the country, leading to its financial and commercial centre, it presents itself unavoidably to thousands from over the length and breadth of the land, travelling to or from its monetary Mecca, and knowledge of it will be spread by them from the Atlantic to Pacific, and St. Lawrence to the Gulf. That "good wine needs no bush" is a wise proverb, but nevertheless the "bush" must not hesitate to make known its whereabouts, or even those who have come to know of the "good wine" will be at a loss where to seek for it.

The building itself and its location, make it impossible for the Daft Electric Company to suffer on this score.



THE NEW FACTORY OF THE DAFT ELECTRIC COMPANY, JERSEY CITY.

Electric Fare Register.

The Brooklyn street car companies are considering the introduction of an electric fare protector. It will be worked by pressure. Whenever a passenger steps on the car a fare will be rung up on the indicator, and the conductor will have to account for it. The Brooklyn companies run too many miles of railroad to have spotters along the track the whole way, and they fear that they do not receive all the fares they should. A man who has invented the electrical indicator wants them to adopt it. It would insure the companies' receiving more money than they get now, but the drivers would have to keep newsboys and lozenge peddlers off the cars or pay their fares, and if two passengers should step on at once the conductor could knock down a fare.

The Baxter Motor Company of Baltimore has been compelled to put on two forces of men, night and day, and still is unable to keep up with orders. The large new shops of the company will be finished some time in August, and then work will be turned out much more rapidly. The new shops will be, when finished, the largest in Baltimore, and are being erected on a lot 320 by 260 feet, and will be provided with a 350-horse Buckeye engine, and will have a capacity for about 1,400 hands. Eight hundred different machines for use in building motors will be put in these shops.

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NEW YORK, AUGUST 4, 1888.

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The August Convention of the National Electric Light Association, we are confident, will be largely attended. So many features of the electrical business have been conspicuously discussed throughout the country during the past half year, such as the alternating current, the burying of all wires, electric railways, etc., that interest has been constantly on the increase, and the New York convention will not only be attended by the majority of former members, but many new faces of persons who have recently become interested electrically will be seen, and they will, every one, be benefited by being present at the Hotel Brunswick, August 29th, 30th and 31st.

The REVIEW takes pleasure in presenting in this issue views and description of the valuable and progressive work of the New York and New Jersey Telephone Company, as shown in the Brooklyn system. This company is most ably managed, having the double advantage of a strong and far-sighted president, and a progressive, experienced and thoroughly practical general manager, who have not hesitated to grapple with that problem, the underground question, as soon as it appeared. We particularly commend the work done by this company in Brooklyn to our friends, the telephone officials of the large cities in general, who will find the REVIEW's description instructive and valuable.

The REVIEW reader who neglects the advertising pages—and we don't think he is numerous—misses much that is interesting, graphic and edifying. The Westinghouse Electric Company recently submitted some interesting letters, and very properly, as it was desired to reach a large, constantly-growing and intelligent constituency, made use of a page advertisement in the REVIEW. Likewise, on the most conspicuous advertising page in this journal, the Sawyer-Man Electric Company announces new and somewhat startling propositions. The Edison Electric Light Company, in recent issues, has given our readers some pointed statements on the situation from its standpoint, that for literary excellence and graphic portrayal we have never seen excelled in advertising columns; and on page 17, this issue, is given a particularly interesting statement, at this time, concerning the three hundred patents owned by that company. Therefore, we say, do not miss the advertising columns of the REVIEW, for there you will find literary, artistic and typographical merit.

CURRENT VS. DOG.

The neat little invitation cards which Mr. Harold P. Brown sent out for his proposed demonstration of Monday last, might appropriately have carried the quotation: "*Parturiunt montes, nascetur ridiculus mus.*"

Mr. Brown has made his demonstration, and it demonstrated—simply nothing, except that for want of experience in conducting such affairs, much needless cruelty was exhibited. With a profusion of electrical apparatus at his command, and every facility for such experiments, Mr. Brown yet left the matter of connections and shifting of circuits to be slowly worked out by twisting wires together and unscrewing and refastening binding posts, keeping people waiting, and giving the dog plenty of time for suicide from nervousness.

The test was not a test in any sense. The dog was a large one, weighing some 76 pounds, his physical condition unknown and unstated, whether famished or well fed, and he was very poorly fastened. Some waste was bound with wire around his right fore-foot and left hind-foot, the waste wetted with water, and connection thus made. Resistance was then taken and announced as that of the dog — 15,300 ohms. This was wrong, as the waste wet with water only would have a high resistance. The dog was then hit with 300 volts continuous current from an Edison machine, again hit with 400 volts, then with 500 volts, and finally given a tremendous thump with 1,000 volts. In his struggles at this stage he got nearly strangled by his halter. Then nine-tenths dead, he was given a dose of 330 volts of the alternating current, and, like a sensible beast, gave up the ghost. Such demonstrations (?) as this are worse than useless. Had the order been reversed, and the alternating current been administered first, it is much more than probable that a final dose of 330 volts continuous current would have been quite as effectual to kill. It was much like pounding a man to jelly with a club, and then changing weapons and finishing him with a merciful bullet.

The situation remains; the warfare goes on, and nothing is proved. But it would be a good thing if one of the wealthy companies authorized a series of *conclusive* experiments under *proper conditions*. If dogs are to be the subjects let there be a fresh dog for every shock, and let the dogs be well-fed and conditioned, and not a lot of poor half-starved vagrants from the pound. And above all let the tests be made in a true scientific spirit which looks not to prove anything but the exact truth, and by a body of men who know the importance of making comparisons only under exactly similar conditions. Such demonstrations would be reliable, and their conclusions irrefutable.

ELECTRO-MOTOR POSSIBILITIES.

Just what part the electro-motor is to take in the future is a theme of engaging interest. Those who have not the time, perhaps not the inclination, to study it will, very naturally, content themselves with what they know or have heard of its first trials, when its apparatus was crude and complicated, its constructors inexperienced, its accomplishment at best but of trifling value. When a man sets out to explore the air and only succeeds in reaching a high altitude, his venture is set down as a failure, though, in reality, the first great step toward the accomplishment of his purpose has been gained. Only the student or the thinking man will look ahead at the splendid possibilities that he has opened the way to. No one now doubts the potency, the practicability of the steam engine. Notwithstanding its enormous waste of power it will turn the shafting of a great mill, propel a 10,000 tons steamer at great speed, or haul thousands of tons of dead weight along the rails. Once, however, it was a crude mechanism, its every promise laughed at even by thinking men. It required a half century of experiment to bring it to its present state of perfection. The electro-motor, on the other hand, has been under experimentation scarcely a decade, and, thanks to the indomitable perseverence and intelligence of its projectors, has made great strides on the road to perfection; indeed many times greater than the steam-engine, and if there be any who doubt its power to supersede the steam-engine in at least an important portion of its present field, they have only to study the theory on which it is constructed, its economy, and the advantages offered by electricity as a motor, to be convinced. Mr. Frank Sprague, who has had large experience in electro-motor construction, says that, so far as trunk-lines are concerned, it is not likely for many a day to take the place of the locomotive, but agrees with other eminent authorities that it will usurp the place of the steam-engine, and in the not distant future, too, in that vast field where small quantities of power must be distributed over a wide section. In the city of New York there are thousands of small factories, mills, passenger elevators and innumerable other demands for a constant supply of power. However small the power required, there must be an engineer and constant shoveling of coal, with its accompanying evils of ashes and dust. Think what a saving there would be in wages, in machinery, in fuel, and in the handling of fuel and its residuents, if only the power required in a single district could be generated at and distributed from a single point! One 1,200 horse-power engine would drive the shafting in over an hundred small shops, run many elevators and the like. Instead of the 150 and more engineers and stokers, two engineers, with a few helpers, would suffice. With steam this is not possible, but with electricity it is not only possible, but practicable; indeed, it has already been accomplished in a small way, and the great scheme itself only waits upon the working out of more economical processes in the transmission of electrical energy to a distance. So rapid has been the development of electrical apparatus that, at times, it seems as if one improvement had scarce time to appear in full view, ere another was treading upon its heels. This being the case the impropriety of establishing a great plant for transmitting small parcels of power before the best-known method of transmission is hit upon, is immediately obvious.

As to motors, we have seen from year to year many lines of street railways built and operated and no thinking man can read the accounts of what Sprague has recently accomplished in Richmond, Va., without admitting the practicability of electricity as a motor, and its manifold advantages over other known types.

Indeed, when we study the unusual obstacles that confronted him, the steep grades, the sharp curves and the inequalities of the road-bed, we can only wonder at his temerity. Here was no even contest between electricity and other forms of traction! Electricity was called upon to do more than was practicable with horses, more than was safe with a swift-running cable. Had he failed, an unthinking public would not have considered these things, but attributed the failure to the incompetency of electricity as a motor. Nor is the "Sprague" motor alone in admirable accomplishment. The "Baxter" has done its share in directing public attention to the many advantages offered by electrical traction; so has the "C. & C.," the "Eddy," the "Thomson-Houston," the "Daft," and the "Fisher."

In any contemplation of the possibilities of the electro-motor, the accumulator must of necessity take an important part. Though it has not made such strides in point of economical working as its prototype, it is of great promise; having a field peculiarly its own, able, as it is, even when cut loose from generator, and even from the ground itself, to perform all manner of work. One has but to turn a switch and lo! there is the power which formerly only tugging horses or a steam engine on the premises could supply.

Even with such contrivances as the telephone and telegraph which facilitate business the way of the projector is hard and long, for though they are both a saving of labor, a business man, if thick-headed and short-sighted, could get along without them, but once let a manufacturer or other user of power get his supply over a wire from a central station, all his neighbors must needs follow suit, for so visibly will it lessen his expenses as to be seen in the price at which he can dispose of his product and hence enable him to undersell them; an argument for the electro-motor that the dullest mind will quickly appreciate.

JOHNS HOPKINS UNIVERSITY TO TEST ELECTRICAL INSTRUMENTS.

In the whirlwind of electrical activity which has swept this country and is still hard at work, it is to a large extent a case of every man his own instrument maker, and the results are obvious. Even the specially qualified manufacturers who make the work a specialty seem to lack universality of standards, and the resulting confusion is most aggravating.

It is a satisfaction, therefore, to note that the recent promise, announced in the REVIEW at the time, of the Johns Hopkins University is now ready for practical fulfillment. Under the able directorship of Professor H. A. Rowland, and the immediate supervision of those talented and indefatigable workers, Doctors L. Duncan and G. A. Liebig, Jr., the University has at a heavy outlay fitted up a special laboratory for exact electrical measurements and a testing room for efficiency and power measurements. Everything has been designed and arranged with a view to obtain special fitness for the one central object—the institution of a headquarters for standards in all electrical measurements, to which all instruments can be sent for calibration and correction so as to conform accurately to the standard. The scheme cannot be too highly praised, and we hope and believe that the University will quickly become a Mecca for the thousands of ailing instruments now in use through the country which only need assurance of the existence of the shrine to start upon the pilgrimage. It is a good work decidedly, and the very trifling charges made for standardizing instruments will certainly have the intended effect of placing the services of the scientific trio above mentioned at the command of even the most impecunious student of electricity. This will be seen from the appended list of charges for measurements and calibration:

Current meters (according to range)	$5.00 to $7.50
Voltmeters " "	5.00 to 7.50
Resistance Boxes " "	5.00 to 25.00
Standard Resistance Coils	5.00
Condensers	5.00
Curve of Magnetization	10.00

We most heartily recommend the laboratory to our readers, and hope they will join practically in this praiseworthy effort at uniformity of standards. A letter to either of the gentlemen named, with request for pamphlet, will receive prompt attention.

The municipal authorities of Paris have voted 1,000,000 francs to erect an electric light station to supply the entire city with light. A cable despatch states that it is doubtful if the government will grant such a monopoly.

Some Remarks About Primary Batteries and Their Use for Illumination and Motive Power.

BY P. H. VANDER WEYDE.

Waiving the question about the comparatively lesser cost of dynamo currents and those obtained by chemical batteries, which will not be contested, not even by the champions of the latter (if they are intelligent and honest), the problem is reduced to the choice of battery for the purpose intended.

Electricians of experience know that in the various styles of electric batteries there are enormous differences between the nature of currents obtained and their behavior during use. In order to give an intelligent review of this subject, I will divide the various styles of chemical or primary batteries into six classes, which division is based, not so much upon their shape and mechanical arrangement, as upon the materials employed and the consequent character of the electric currents obtained.

FIRST CLASS OF PRIMARY BATTERIES.

To the first class we must naturally count the small discs of zinc and copper or silver alternating with discs of cloth, paper or other porous material moistened with a liquid which will chemically act upon the zinc.

To this class belongs, of course, the column or pile of Volta, consisting in a series of many such discs superposed, with alternate porous moistened discs between. The action of this pile is very evanescent or short-lived; it exhibits however while it lasts a very high electro-motive force, and is able to produce considerable commotion through the body when the hands are brought in contact with the extremities of the pile.

The publications of the beginning of this century contain illustrated descriptions of a great many varieties of this pile, and they also describe secondary piles which were inactive until the charge of a primary pile was passed through the same, when it gave the charge back. It is thus seen that, notwithstanding, those piles are now obsolete, the experiments made with them contained the germ of the later discoveries and even of the storage batteries, which now constitute so promising a path of pursuit to the investigator.

SECOND CLASS OF PRIMARY BATTERIES.

The first step in this direction appears to have been made by Pepys when he prepared for the Royal Institute in London his battery, which consisted in a sheet of zinc and one of copper, coiled around one another, with a porous substance between; the sheets were each 60 feet long and 2 feet wide, and suspended over a tub with acid, in which they were immersed and removed by means of a pulley and crank. This arrangement, notwithstanding it contains much more metal than was present in all the discs of Volta's pile, produced no commotion in the human body, but it exhibited considerable heating power; the discharging current burned iron wire and exhibited other signs of its great heating capacity.

We know now that this peculiar behavior, which at that time was not clearly understood, has its cause in the low electro-motive force of a single cell, and is only produced where many cells are connected in series, as is the case in constructing a pile of Volta. The electro-motive force is independent of the size of the plate, which regulates only the quantity of electricity developed, but not the electro-motive force which can only be obtained by combining the series: zinc, liquid, copper—zinc, liquid copper, etc.

Combining in this way large cells, as was done by Humphry Davy and Wollaston, the battery bearing the latter's name were produced (zinc and copper in diluted SO_3); next to this comes the Smee battery (zinc and platinized silver or carbon, also in SO_3). In both of these the current, at first strong, becomes soon very weak. The cause of this is a deposition of a film of visible or invisible hydrogen, covering the copper, silver or carbon plates, which hydrogen is set free by the decomposition of the water from which the zinc takes up the oxygen, an action which has been called polarization. The readiest way to destroy the polarization is to give the Smee battery rest, or better still to take the Wollaston battery out of the liquid, for which purpose they are usually mounted suspended from an axis, by which means they can be caused to descend in the liquid only for the time the current is required. This was especially put in practice by Robert Hare, of Philadelphia, some of whose experiments the writer of this article repeated in 1835, and who had afterwards the satisfaction to see Prof. Hare in 1849, when he showed him his large deflagrators in the University of Pennsylvania, Philadelphia.

One of the batteries consisted of 250 cells, each of which contained a zinc plate of 17 by 25 inches, surrounded by copper of twice that surface. When placed in the acid he produced between carbon cylinders a luminous arc, which by separating the carbons could be elongated to one and a half to two inches long. He melted platinium, fused heavy spar, while iron wire was burned with a kind of an explosion, and human eyes were unable to bear the light. Dr. Hare himself temporarily lost his sight by inflammation, which only was subdued after several weeks medical treatment.*

Special attention is here given to these old experiments for two reasons: firstly, to do justice to the old investigators, the pioneers in the path of electrical research, whose merits are now often forgotten, but secondly and principally to point out a grave error which Hare committed when he attempted to improve his deflagrator by abolishing the separate cups or cells, and plunging 100 pair of plates all in one large single trough containing the acids, and which he describes in the publication mentioned in the foot note, and which the writer saw when examining Dr. Hare's improved deflagrator.

If we combine galvanic elements in series so as to increase the electro-motive force, we must, in order to attain the maximum result, not only separate the liquids of the different cells, but even insulate every cell from its neighbor. In 1630, the difference between electro-motive force and quantity of current was not yet understood, volts and amperes were unknown, and an error in this respect, which was excusable then, is no more so in 1888. When at present an electrician attempts to improve a Daniel battery by connecting the plates in series, and then causes the liquid to communicate in all the cells, in fact to have the whole of them in one single trough, and thus destroys part of the only theory in which the battery is deficient, namely, part of its electro-motive force, we must conclude that he does not understand the modern A B C of electricity. But of this further on.

THIRD CLASS OF PRIMARY BATTERIES.

The polarization, which is the great drawback of the batteries of the previous or second class, as it prevents them from continuity of activity for giving the required current, is obviated in the Grove and Bunsen batteries, and the many variations made upon them, in all of which the hydrogen plates (platinum, carbon, graphite, or even cast iron) are surrounded by strong nitric acid, N_2O_5, which, being rich in oxygen, with which it readily parts, disposes of this hydrogen at once and forms water, for which purpose the N_2O_5 changes into N_2O_3 and N_2O_4, which escape as very noxious fumes. The zinc in these batteries is immersed in diluted sulphuric acid, which is separated from the nitric by a porous cup or partition. It is clear that such batteries can only be used in localities where arrangements have been made for active ventilation, so as to dispose of the fumes. This class of batteries possess almost double the electro-motive force of the former (the second class), and maintain an almost constant current until the liquids are exhausted or the zinc consumed.

* See Silliman's American Journal of Science and Arts, p. 1830.

Also, Das Laboratorium, Weimar, Germany, 1831.

Also, Bychagen tol da Natuurkende, Amsterdam, 1832, p. 117.

FOURTH CLASS OF PRIMARY BATTERIES.

The nuisance of the nitrous fumes has been overcome by the use of a solution of bichromate of potash mixed with sulphuric acid; the latter sets some of the chromic acid free, which then is decomposed and gives some of its oxygen to the hydrogen, becoming sesquioxide of chromium, forming, with the potash and sulphuric acid, chrome-alum; no fumes can be created here, but the chrome-alum deposits as crystals, whose the accumulation is a drawback, and will soon end the activity of the battery if care is not taken for their removal, also that of the remaining liquid and its renovation by fresh solutions.

Modifications of this style of battery are called Fuller's, Chutaux, Delaurier, Grenet, Fitzgerald, and Molloy. They all distinguish themselves by an electro-motive force nearly as high as those of the second class, and for this reason have been advertised as being adapted for electrical illumination for private residences, for running sewing machines, revolving ventilating fans, and performing other light mechanical work, but their activity is comparatively short-lived, in spite of the attempts to correct this defect. They require a frequent replacement of the exhausted liquids, and while this has been corrected by automatic arrangements, they are subject to the labor of frequently cleaning the cells, the carbons, the zincs, and the renovation of the latter; in the end, they are found to be very expensive, hence they are always abandoned by all who have gone through the experience of using them. They are good for nothing but for exhibiting their operation for electric illumination and for motive power, to the ignorant, and by false representations induce them to buy such a battery, or, what their exhibitors greatly prefer, to buy some shares of stock in their new illuminating and motive power company, which is, according to their representations, the most profitable investment possible for small capital, claiming, as some of them do, that the electric light thus produced will cost only one cent per hour, and a horse-power can be obtained by the consumption of one pound of zinc per working hour. Those who are foolish enough to believe this must be impressed with the prospective profits of investing in an enterprise which surely will be patronized by every one who wants to have at his disposal an always available horse-power for five cents per hour, and electric illumination for one-fifth of that amount.

FIFTH CLASS OF PRIMARY BATTERIES.

At the head of this class stands the Leclanché which, since the introduction of the telephone, has earned a well founded reputation of adaptability for the circumstances under which currents adapted to the requirements of telephonic communications are needed. It possesses the great advantage of giving, for periods of that duration, currents which, if not equal to those of a Grove or Bunsen cell, are at least far superior to a Smee battery at the beginning of its action, but it has the disadvantage of being soon exhausted by polarization when the current is kept closed for a length of time; as, however, it very quickly recuperates when the circuit is broken and soon regains its normal strength, it is eminently adapted for currents of short duration, such as are required for the operation of the telephone, alarm bells, telegraph offices when the business is not continuous, and for similar circumstances.

In this battery the liquid is chloride of ammonium, and the product chloride of zinc, while the ammonia enters the porous cell or prism, and there interferes with the free action of the oxygen of the peroxide of manganese combined there with the carbon. When at rest the volatile ammonia escapes, the oxygen becomes again ready for action, and the battery is restored to the primitive condition, which lasts until the chloride of ammonia is decomposed or the lime consumed.

Before treating the sixth and most important class of batteries, we will describe some of the modern modifications of the Leclanché, which are well worth noticing, and close this article with a table of the comparative electro-motive force of various batteries, which has been reduced from Latimer Clark, by making the Daniel battery 1.25 volts. Notwithstanding that the usual definition of a volt, as given in the books, is the electro-motive force of a single Daniel cell, I find that a compact gravity battery when in good condition and tested by my voltmeter, after having it compared and corrected by the best instruments at the Philadelphia Elecric Exhibition of 1884, gives for the Daniel cell 1.25 volts, which reduces the Wollaston to 1.00 or one volt.

Table of the electro-motive force of various primary batteries:

Wollaston, at the start	1.00 volts.
" after use	0.50 "
Smee, at first	1.26 "
" after closing	0.60 "
Grove, constant	2.17 "
Bunsen, "	2.15 "
Bichromate, fresh	2.25 "
" strong solution	3.00 "
" old solution	1.50 to 1 or less.
Daniel, very constant	1.25 volts.
Leclanché, fresh	1.73 "
" after closing	1.20 "
" later	0.50 "
" after rest	1.50 "

It is important to observe that the electro-motive force of the Daniel battery is inferior to all the others when they are freshly started, except one, the Wollaston; after closing the current, however, they all drop down below the Daniel, which keeps up the full amount with admirable steadiness.

THE ROGERS SYNCHRONOUS TELEGRAPH.

Dr. J. Harris Rogers, of Washington, D. C., has now brought to simple and practical form his ingenious system of synchronism, for which he has recently obtained patents. Unlike all other inventors, Rogers has started out with the mental admission that it is not possible to obtain practical high speed synchronism of a transmitter and receiver by any method of transmitted regulation. He takes a radical departure, and applies a visual indicator to the receiver which follows all changes of speed and faithfully indicates every variation; at the same time telling whether the receiver is fast or slow with reference to the transmitter. A simple application of friction then instantly brings the receiver into synchronous relation with the transmitter, no matter what the speed of the latter. The visual indications are given 800 times per minute, so that no chance arises for false signals. The apparatus is automatic, the message being received and printed at the rate of 180 words per minute in large distinct letters.

The invention is very beautiful and simple and will have a wide field of usefulness. We hope to fully illustrate it shortly for our readers. The inventor has been perfecting the idea for a long time, and has been ably seconded by H. P. Waggaman, a prominent business man of Washington, D. C., who is now engaged in the commercial introduction of the invention.

OUR BOSTON LETTER.

(Special Correspondence.)

Electrical business in general is quieting as the hot days strengthen; still, Boston is probably more active than many cities of its size in the matter of electric roads, growing out of the need of more rapid transit. The West End Railway will no doubt soon have permission to adopt this new motor power, and your correspondent is informed that the company favors a combination of the Sprague and Bentley-Knight system, both of which were seen in operation by a party of the head officials, who were under the broad electrical wing of Mr. Frank Ridlon during a recent tour. The very full account of the Richmond electric road, which was published in the REVIEW, was much sought after by the visitors on their return to Boston, and copies telegraphed for to be in time for the meeting of the West End Company's Board.

It was reported in this city last week that Mr. Edward H. Johnson had resigned the presidency of the parent Edison Company, and in future would devote his great energies to the Sprague Electric Motor Company of which he is president and general manager. H.

Boston, July 30.

TELEGRAPHIC

.... The New Mexico & Texas Telegraph & Telephone Co. has been chartered.

.... The Troy, Ala., Telegraph Company has been organized with L. M. Bashinky as president. They will soon commence work on their line.

.... The capital stock of the San Francisco District Telegraph Company has been increased from $100,000 to 500,000, divided into 10,000 shares of $50 each.

.... The City and County of San Francisco has instituted proceedings against the Western Union Telegraph Company, to procure the payment of the Company's assessed taxes upon its franchise, amounting in all to $830.45.

.... The Postal Telegraph Company has just placed an order with the Western Eletric Company for some underground cable. One of the first pieces of Patterson cable that was laid underground was put down for the Postal Telegraph Company some six years ago and is working perfectly to-day. The new cable just ordered by the Postal Telegraph Company is an extension of this original cable.

.... At Olympia, the Tacoma, Orting & Southeastern Railroad Company, has been organized with a capital stock of $900,000. Directors, T. F. Oakes, C. W. Griggs, James M. Buckley, Henry Kewitt, Jr., and George Browne. Its objects are to construct and operate a railroad and telegraph line from some point on the Northern Pacific railroad between Tacoma and the Cascade mountains, in a southerly direction, to be extended as far south as may be deemed advisable.

.... Lewanee county, Michigan, has a co-operative telegraph line which began by two farmers connecting their houses with a wire, and which has extended, until now it has 65 miles of wire and 90 offices, two-thirds of which are in farmhouses and the others in stores where the farmers trade. Every farmer is his own operator, battery man, and line repairer, and can use the lines as much as he pleases. They communicate with each other, give orders to the stores, and receive early information of important news over their wire. One farmer had his life saved by it. He took poison by accident and there was no doctor within several miles, but he telegraphed to the nearest one, told what was the trouble, and was directed to fill himself up with sweet milk and keep filled until the doctor could get there. The prescription was successful.

An English Opinion on an American Insulation.

In a recent issue of the *Electrical Review*, of London, the Okonite insulation was commented on very favorably at much length. After mentioning that Okonite had stood the test of four years' use in this country and its extensive use, the *Review* says:

"Okonite" is the name given by J. J. C. Smith, of Passaic, New Jersey, to the rubber composition which he uses as an insulating covering to electric conductors manufactured under his system, in order to distinguish it from many other compositions used for the same purpose. The composition is a scientific product obtained by many years of practical experience in the manufacture of rubber; the process is, however, a secret, but it is stated that Okonite contains only 38 per cent. of fine, pure caoutchouc, the balance being pure, natural hydro-carbon oxides and silicates; it contains no oxidized oils, or other detrimental, artificially produced substitutes. The essential difference in this dielectric is in the mode of manufacture. The composition is not applied as in other manufactures, but in a manner special to itself, which consists in placing the conductor in long strips of the composition which are wrapped round the wire and closed with a longitudinal seam. A plan somewhat similar to this was applied to gutta-percha in its earliest days, but with the present material it is carried out in a very different manner secured by patent. The composition is first rolled out upon sheets of stout tin foil, by the pressure of the rollers of the machine, the two surfaces are made to adhere firmly. The sheets of composition with the metallic envelope are then cut into regular strips of a width slightly in excess of that required to wrap round the wire, with a longitudinal seam. The okonite strips with the metallic covering are then joined end to end forming a long continuous band, which, as it is formed, is wound for convenience and for the operation of covering, on to a reel. The wire to be covered is also wound on to a reel, and a special machine (patented) is employed through which the wire and the tape pass, by means of which the insulator is laid on longitudinally and "seamed." The metallic envelope has the important advantage of protecting the insulation covering during the process of vulcanization, against contact with air, moisture or steam, and, according to the inventor, producing remarkable results, the insulation being higher than that by any other process, and increased strength, tenacity and durability being obtained with great uniformity in the quality of the product. The covered core previous to vulcanizing is wound on to a special large reel or drum to the amount of two or three miles. This reel, when so charged, is then rolled into a vulcanizing vessel in a horizontal position. During the process of vulcanization the reel with its charge is slowly rotated; this rotation has the effect of keeping the metallic conductor perfectly in the centre of the insulation covering, which becomes very soft when heat is applied before the actual vulcanization takes place. The rotation of the reel and charge continually changes the gravity of the conductor, thereby preventing the dislocation of the conductor from its central position in the insulated covering. This last named improvement avoids the very serious trouble in the manufacture of vulcanized rubber core, eccentricity of conductor; besides, it saves a great deal of manual labor over the old methods. After the insulation covering is vulcanized, the metallic tin envelope having served its function, is removed at a trifling expense, and by re-melting and re-rolling into sheets it can be used for the same purpose for a long time. * * *

We have ourselves tested samples of this core mechanically, in a variety of ways, and also under the application of heat, and find that it fulfills all the conditions guaranteed by the makers. While resilient it is remarkably tenacious, and its strength and toughness are very great; the wires are uniformly well covered, and its durable qualities may be taken, from all the evidence we can obtain, to be very great.

Its mechanical properties, high insulation, and indifference to heat, render it a very efficient core for electric light purposes, and we should not be surprised to see it used largely for such positions and places where most insulated wires have hitherto proved failures.

The Kansas City Steam Heat, Light and Power Company is keeping busy in planning what it will do when it is ready to carry on the work of construction, and the planning is no idle work, when it is seen that it includes the arrangements for a central steam station of 3,500 horse-power, four electric light stations, with a total capacity of 10,000 electric lights and 1,000 arc, the piping and wiring of the entire business portion of the city for the conveyance of the steam and electricity.

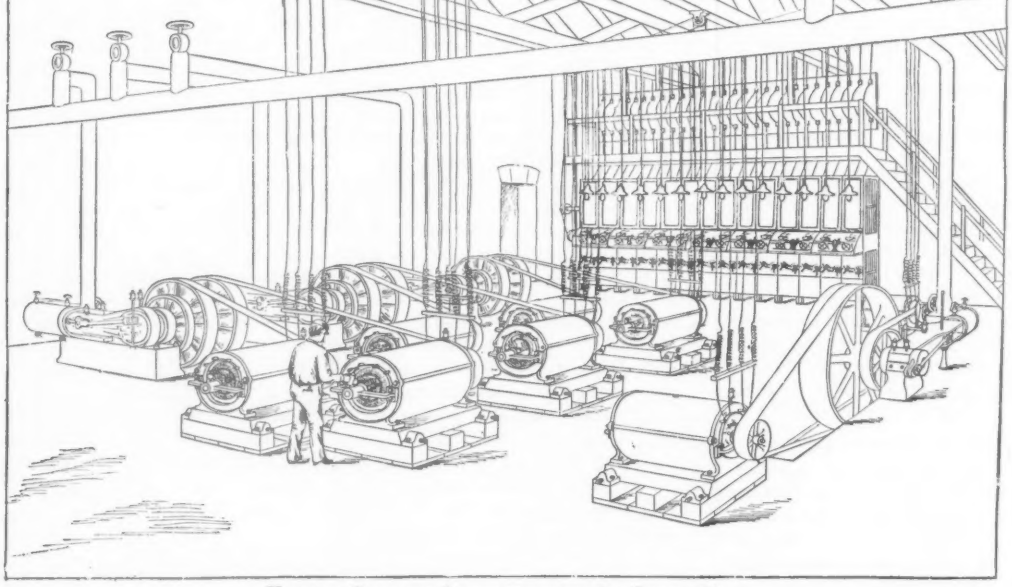
The Heisler System of Long Distance Incandescent Lighting.

The system of incandescent lighting invented by Charles Heisler, of St. Louis, occupies the unique position of being the only single wire incandescent electric light system in the world.

It gives a steady, white and pure light which can be carried to a great distance. The loss of current in distance, it is claimed, is very small, and in this fact lies the value of the system. The wire resistance is small, from the fact that any kind of wire can be used for the current, a No. 8 B. & S. weather-proof answering all the purposes of out-of-door lighting, while a No. 11 fireproof serves for inside use (even an iron wire can be used), and with these wires the loss in distance is said to be less than one 30 candle-power lamp per mile.

The lamps are in direct series on a single wire. Altering the course of a circuit is a matter of no trouble, and extending a circuit is merely the splicing of additional wire.

The current in the system is under the control of an automatic regulator, which adjusts itself when the lights are turned on or off, or a lamp filament broken. It protects the lamp and the machine against overcharge and accident, while consumption of power is reduced or increased according to the number of lights burning on the circuit.



HEISLER ELECTRIC LIGHT STATION, ST. LOUIS, MO.

The inventor of the Heisler system claims the special point of being able to produce by his system seven 30 candle-power lights to the horse-power, not only at the central station, but at any point over the whole circuit, and during any period of its running, the lamps remaining bright their whole lifetime.

In operating the Heisler dynamo a speed of 150 to 180 revolutions is fast enough, as the dynamo is never run at higher speed than from 600 to 800 revolutions.

For supplying a general illumination, the Heisler Electric Light Company have adopted a 30 c. p. light as the standard, with the addition of a 20, 45, and 60 c. p.

Safety catches, converters, distributors, etc., are not used in this system.

The St. Louis Illuminating Company was the first central station to adopt the Heisler System (a view of the station appearing herewith), and is now doing a very profitable and growing business, having a capacity of 1,200 lights, of 30 candle power each, lighting stores and dwellings in the heart of St. Louis. Seven 30 candle power lights are said to be produced to the horse power; and the average life of the lamps is from 700 to 900 hours; the system gives satisfaction to the citizens of St. Louis who are using it.

Twenty-four Heisler Central Stations were established, we are informed, in less than one year. In some of these instances the power station is located over five miles from the lamp distribution. The circuit at Mattawan and Fishkill, New York, which was put up last summer, is one of the longest incandescent circuits—covering a distance of eighteen miles. Among other places which have adopted and are operating Heisler incandescent plants are Salt Lake City; Eugene City, Oregon; Liberty, Mo.; Kingman, Kansas; Fergus Falls, Minnesota; Portland, Oregon; Napa, Cal.; Ogden City, Utah; Ottawa, Kansas; Vincennes, Ind.; Pendleton, Oregon; Mankato, Minn.; The Leavenworth Coal Co., of Leavenworth, Kansas; Monticello, Minn. Heisler plants have also been installed at Saugerties, New York; Orange, New Jersey.

Since the establishment of an agency in New York at 15 Cortlandt Street, by Messrs. Hyer & Montgomery, the growth of the Heisler system in the East has been very satisfactory to them. The first plant installed by these gentlemen was the one which lights the towns of Mattawan and Fishkill, and this was rapidly followed by those above enumerated in New York and New Jersey. Work on Heisler plants has been begun in Johnstown, N. Y., and Greenport, N. Y., and is being rapidly pushed to completion. Negotiations are pending for the establishment of the Heisler system at other points in New York State and city.

OUR KANSAS CITY LETTER.

(Special Correspondence.)

Two meetings were held in room 105, Hotel Victoria, last night. One was the regular quarterly meeting of the United States Military Telegraph Corps, the other was the first meeting of the Kansas City branch of the Old Time Telegraphic Association. In fact the latter was organized last night by the few who attended the meeting. President Day K. Smith called the meeting of the telegraph corps to order. Day K. Smith, J. D. Cruise and George M. Meyers were appointed to secure rates for transportation to the national meeting of the corps which will be held in Chicago next month. It is probable that the Kansas City organization will attend in a body. Smith, Cruise and H. Lithgow were appointed a committee to urge the claims of Kansas City as the meeting place for the next annual convention.

The United States Military Telegraph Corps was organized in 1882, seventeen years after the war. Its object was to obtain just recognition from the government for the services rendered by its members during the war. They shared all the danger and the hardships of the boys in blue, but without any of the glory, pay or promotion. They were on the pay-roll only as civilians, and when captured and thrown into prison, as many of them were, their pay stopped until they were able to resume their place at the key again. Even their usefulness was stoutly denied until the first West Virginia campaign which settled it emphatically. From that time on they were considered valuable adjuncts to the army, and Grant, Sherman, Sheridan and the other generals were not slow to recognize their importance. Genera

Logan introduced a bill in Congress in their behalf a short time before his death, and Congressman Warner, of Kansas City, has advocated their claims during the present session. The large majority of the members of the corps are under the sod. Of the 2,500 men employed in the service, not more than 500 are alive to-day. The Kansas City branch is the largest, containing twenty-five members.

After the meeting of the military telegraphers had adjourned, the "old timers" met and effected an organization. John M. Wilson was chosen president; George M. Meyers, vice-president; D. A. Williams, secretary and treasurer. This organization is composed of those who were operators 20 years ago and who served at least three years during that time. There are about 2,500 in the country.

Richard Edwards, of Kansas City, Kas., who has been insane on free love and infidelity for the last fifteen years, has at last been declared insane, and his hallucinations were stated to be on electricity and its ability to cause perpetual motion. He was sent to jail for mailing a paper which he published. It was called *Light*, and was a very bold, outspoken advocate of unqualified free love. While in jail he imagined himself telegraph editor of a great daily paper, and there was no spot on earth from which he couldn't receive an immediate special transmitted by means of the latent electricity in the earth and air. His dispatches, which he wrote out in most sensational form, he pasted on the walls of his cell.

The Home Signal Telegraph and Messenger Company has changed partners. While George M. Myers, one of the most interested stockholders, was also interested in the Pacific Mutual Company, the Home Signal carried messages to that telegraph company free of charge to the sender, and at a specially low rate to the receiver. Now that Myers is entirely out with the Pacific Mutual, he has formed a combination with the Western Union similar to the former one with the Pacific Mutual. The Pacific Mutual, on the other hand, is establing a messenger service of its own, and proposes to contest every inch of territory in the city.

George W. Conover, who was formerly assistant general manager of the Home Signal Company, is now the agent for the Electric Protection Supply Company of Chicago. His territory embraces Kansas, Nebraska and Western Iowa. He reports good success.

Manager Woods, of the Western Union office, chief operator Brownson, and Wheatstone chief Hatch are spending the summer in a novel but truly delightful and sensible way. With their wives and families and a few friends they have established a camp a few miles from town, near a spring, a small stream and a dummy line to the city. Their camp is in a most beautiful spot, cool, well-shaded and picturesque. Here the ladies and children spend all their time, free from the noise, heat and dust of the city, possessing all the advantages of the professional summer resort and watering places, with none of their disadvantages. As soon as their day's duties are done, the gentlemen hurry to this spot and return the next morning, much more refreshed than if they had spent a week at the lakeside.

Alderman Lee, president of the Council, has received replies to only two of the 80 letters sent out by him inquiring the telephone rates in other cities. The answers received are from Omaha and St. Louis. The condition of telephone rates at St. Louis is too well known to be repeated here. In Omaha, the charge is $5 a month for an instrument, and 50 cents a month for every quarter of a mile between the central office and the location of the instrument. For one quarter of a mile or less, the charge in Omaha is $66; in Kansas City, $72; for half a mile in Omaha, $72; Kansas City, $72; for three-quarters of a mile in Omaha, $78; in Kansas City, $72; for a mile in Omaha, $84; in Kansas City, $81; for a mile and a quarter in Omaha, $90; in Kansas City, $90. From that point on, the Omaha rates are $3 less for each quarter of a mile than the Kansas City rates. But most of the telephones are included in the three-quarters of a mile, or at the farthest, a mile. Within that limit, it seems that the Kansas City rates would average much less than those of Omaha.

The Western Electric Construction Company has been reorganized. Mr. Ford S. Caldwell has bought the interest of Mr. W. D. McQuesten, who retires from the company. Mr. M. E. Bates has been made the general manager, a position for which his knowledge, ability and skill, and his unflagging industry and energy pre-eminently fit him.

Mr. H. M. Cutler, representing the Loomis electric company of Boston, has gone on a little jaunt down into Kansas intending to wake up Wichita, Arkansas City and other points.

Mr. E. R. Weeks of the Kansas City Electric Light Company has returned safely from the East, and Mr. C. H. Rusling of the Thomson-Houston agency has gone East, thus preserving the world's equilibrium.

The Southwestern Electrical Supply Company is fitting up its new offices in the Electrical Exchange in a very handsome manner. One of the most attractive features is the elegant display case presenting a large and varied exhibition of Partrick & Carter's electrical goods.

Mr. C. H. Cone, the local and western agent of the Electrical Supply Company of Chicago, is unusually happy at present. He has just secured the contract for supplying the Kearney, Neb., Canal and Water Supply Company with general supplies, tools and P. & B. wire as follows: 2½ miles of No. 30; 1¾ of No. 1; 8 of No. 2; 3 of No. 3; 4 of No. 4; 4 of No. 5; 1 of No. 10; 1 of No. 12. He had seven competitors, but distanced all of them. He is not only pleased on that account or because the order is large, but because it is for such an important plant. By a canal 13 miles long bringing a big body of water down a steep grade, the company has secured great power and will have for lease, when its plant is completed, over and above what is needed for its electric lights and motors, 2,500 horse-power. A 1,000 Edison incandescent electric light plant is now being put in; 40 Thomson-Houston arc lights; one 30 horse-power motor and one of 20 horse-power. A 100 horse-power motor circuit is being established.

Mr. O. C. Steele, representing the Brush Electric Light Company, is busy superintending the establishing of an electric light plant at Marysville, Kan. The Southwestern Electric Supply Company has the contract for furnishing all the supplies for this plant, including poles, wire, etc.

The Western Electric Company has also the contract for putting two dynamos of 600 light capacity in the Elms Hotel, at Excelsior Springs. The Hawkeye Electric Manufacturing Company, of Oskaloosa, Iowa, through its Kansas City agent, Mr. Charles Grover, is putting in two ½ horse-power motors, two 1 horse-power, one 5 horse and one 10, for the Hutchinson, Kas., water, gas, electric light, heat, power and telephone company. (I understand this company has apologized for not having charge of Hutchinson's telegraph also, and has promised to do its best to obtain it, and so should not be censured for that omission.) The Hawkeye is also putting in 25 arc and 300 incandescent lights at Horton, Kas., and a 1 horse and a 2 horse-power motor at Missouri Valley, Iowa.

During the rain last Thursday, a man laid his hand on one of the Kansas City Electric Light Company's underwriters' wire. Zip! Holy murder! A short circuit had been formed. The man yelled as if he were being tortured by a thousand demons. A friend pulled him away from the tenacious wire, receiving a startling shock himself. The main sufferer, however, received in addition to his shock, a bad burn on one of his fingers, and his physician fearing gangrene might follow, amputated a portion of the finger. It is now understood that the sufferer will sue the Kansas City Electric Light Company on the ground that the wire was not properly insulated; that it should have been placed out of reach, or guarded in such a way that it could not have been touched accidentally. The electric light company will have witnesses who will testify that the man touched the wire purposely, to see if he could receive a shock. KAWSMOUTH.

Kansas City, Mo., July 24.

OUR ARKANSAS LETTER.

(Special Correspondence.)

The Little Rock Electric Light Company will soon be prepared to supply its patrons with incandescent as well as arc lights. A good deal of new machinery is being put in by them and will soon be in operation. This company use the Brush system, and have one of the best equipped and located stations in the southwest.

W. B. McDonald, superintendent of construction for the Fort Wayne Jenney Electric Light Company, arrived in the city yesterday morning, and will set about constructing the plant for this city at once. He has forty days in which to complete the job, as the plant is to be in running order by September 1. The poles have been gotten out, at least a large number of them, and are now lying by the Valley Route track, near the Thomas Cotton Press Works. Mr. McDonald is here to stay until the plant is put up and in operation. He will make his office for the present in the City Hall. Besides the arc lights this company will erect four star towers in this city.

Mr. Frank B. Knight, special agent of the Bell Company, has been amusing himself at Dallas, Texas, burning Pan electric telephones. He destroyed 2,500 that way the first of the month. He is expected here soon, where there are quite a number of "pans" destined for the same fate.

A company is now being organized here for the purpose of putting in electric fire alarm boxes, the same as are in other cities. It is believed they will purchase the poles and wires owned by the Southern Telephone Company, and that the citizens of Little Rock will be given an opportunity to take stock in the enterprise. If this movement proves a success there is no reason why the underwriters of the city should not make a reduction in the rates of insurance, as it will materially decrease the danger of having disastrous fires.

The plant of the Southern Telephone Company, which was enjoined and closed here the 1st of May last, already shows how rapidly a plant of that sort goes to pieces when not carefully looked after. A few more months of idleness will show the line and wires a total wreck.

The Erie Telephone Company has placed 130 telephones since the 1st of May, a net gain of 90, and now have 394 in operation, with a number of orders to fill. The prospects are that they will have 450 to 500 telephones in use here by January 1st next.

The writer attended a private seance of a new "electrical or magnetic" girl lately, who got off the usual stock of tricks, but failed to develop any magnetic qualities. There seems to be nothing more than main strength, and a trick of handling it to good advantage, about the business to us, but if people want to call it electrical, who objects?

Telephone operators receive lots of queer, foolish and funny calls everywhere. But a fellow here gave the exchange a good one the other day. He rang up and called for "the wagon yard." When asked "what wagon yard?" replied: "Why! the one I left my wagon at." Of course he got it. Another chap the same day, called for "the depot," and when the operator wanted to know what depot, sang out: "Say, can I come down there with my trunk and valise and go?" The operator told him "yes," and he undoubtedly went.

Little Rock will soon be well supplied with electric lights and electric light companies. The Little Rock Electric Light Company, which has been in operation for several years, is now preparing to furnish incandescent as well as arc lights. The Fort Wayne Jenney Company are to place a $27,000 plant for the city's use, and a company has just been organized, $20,000 raised, and plant ordered to operate an Edison incandescent system. Over 1,000 lamps have been subscribed to begin with. Among the places to be lighted are the Capital Theatre, Capital Hotel, and several large stores and offices. RUHTRA.

Little Rock, Ark., July 21.

Telephonic News

*** The Erie Telegraph & Telephone Co., at Dallas, Texas, will spend about $5,000 more in improving and extending their telephone lines.

*** Beginning the first of this month, Cortland, N. Y., will have night telephone service, and the subscribers are happy. There are 130 telephones in use there.

*** The telephone exchange at Potsdam, N. Y., has been abandoned, because subscribers would not pay the rates demanded, and only a single telephone remains in town.

*** The following is a statement of business of the New England Telephone and Telegraph Company for quarter ending June 30th, 1880: Gross receipts, $280,116.45; expenses, $189,791.62; net earnings, $90,324.83; construction, $23,249.46.

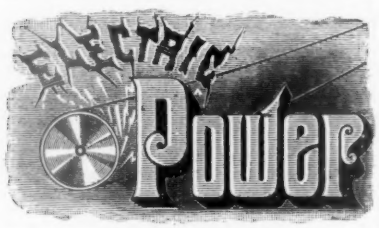
*** At a meeting of the directors of the New England Telephone and Telegraph Company held July 25th, a dividend of 75 cents per share was declared, payable on Wednesday, August 25th, 1888, to stockholders of record at the close of business on Tuesday, July 31st, 1888. The transfer book will be closed from August 1st to August 14th, 1888, both days included.

*** The life saving stations along the south coast of Long Island are all to be connected with each other by telephone, and those isolated from the mainland are to be connected with the nearest village. Surveyor Boland of the Treasury Department is at present making a survey for the laying of a cable between Montauk Point and Rockaway Beach. The work will probably be completed by October 1.

*** At Providence, R. I., a large force of men is now engaged in rebuilding the telephone lines between Providence and Boston. Twelve new copper wires are being added to the line. During the continuance of this work the service is to some extent interrupted. Upon its completion, however, the long distance service between Providence, Boston, Worcester, New York and many other points will be in perfect condition.

*** The electric light wires in Norwalk, Conn., are erected on poles planted in such a way as to greatly interfere with the wires of the Southern New England Telephone Co. The telephone people have sued out an injunction restraining them from further erecting wires and poles in such a way as to cause inducted currents on the wires of the telephone company. If the terms of the injunction are not complied with, damages amounting to $5,000 will be demanded.

*** The romance of electric inventions has not its counterpart in fiction, says a correspondent. A little more than a decade ago, Telephone Bell, who is now worth $6,000,000, was walking about Washington "on his uppers" and trying to sell his telephone stock for ten cents on the dollar. Shortly before this he was teaching a deaf and dumb school in Boston, and his pocket book was in a continual state of leanness. Now he has an income of hundreds of dollars a day. He is surrounded by fine pictures, owns a magnificent residence, and his soul rejoices in all the fatness which money can give. The telephone gave a great impetus to electrical inventions. The electric light soon followed it, and there is a millionaire in Cleveland, named Brush, who was working at $15 a week before he struck the light which turned his poverty into fabulous wealth. I met an assistant of Edison in New York, and he tells me that the phonograph, which is to be run by a small electric motor, is about perfected, and that it will be in general use before many months. It will cost less than $100, and one can talk his ideas into it and have them reproduced in the same language and tones in which he uttered them.



The electric railroad in Sacramento will be in running order the first part of August.

The foundry of the Edison Machine Works, Schenectady, N. Y., was destroyed by fire Friday of last week. Loss, $32,000, covered by insurance.

The Middlesex Electric Light Company will put in during the coming Fall a long-distance day circuit of arc light motors, to furnish power and light to places in Lowell, Mass.

The growth of the Baxter motor in Baltimore has been so extensive that the Brush Company of that city has found it necessary to install an additional engine of 100 h. p. They are now running three engines on motor circuits exclusively, and are supplying current to about 200 Baxter motors.

The Sprague Electric Railway and Motor Company, after a very thorough investigation of different systems by the officers of the railway company, have been awarded the contract to equip the Cleveland, Ohio, electric road. This is to be a very complete equipment, consisting of eight miles of track and 16 cars, iron poles, etc.

An electric motor is in successful operation for wood sawing in Lewiston, Me. It is a 6 horse-power, and with a 26-inch saw, which was driven at a velocity of 1,450 revolutions per minute, a cord of slabs was sawed in 20 minutes. The proprietor claims that with a 6 horse-power electric motor he can do more work than with a 10 horse-power steam engine.

A plant for the electrical transmission of power is being constructed in New York City, located on Center street at the corner of Leonard, in which it is proposed to furnish power anywhere between Broadway and Bowery and Grand and Chambers streets. The start is made with a 40,000 watt special Edison dynamo which is already in place. The connections to some of the motors will probably be made this week. Sprague motors will be used. Mr. W. H. Cole has charge of the construction.

Personal.

Col. L. W. Burnham, of Boston, passed through New York last week on his return from a southern tour, and was made welcome by his many New York friends.

Col. Henry C. Davis, president of the Electric Club, is expected home from England on the "City of New York." Mr. James G Blaine will come over on the same vessel.

Dr. J. H. Mason, of Boston, recently returned from England, passed through New York last week *en route* for New Orleans. His Simplex wire he reports in very satisfactory demand.

Col. John C. New, who is one of the chief men in the Republican campaign management, is well known to many electrical people, and is a welcome visitor at the Electric Club, New York.

D. W. Killicut, insurance inspector of Boston, was a New York visitor recently, and while here took a turn through the Okonite factory, expressing much interest in the method of manufacturing this very popular insulation.

Mr. C. H. Maclilie, of Chicago, Ill., has entered the service of the Sprague Electric Railway and Motor Company, through its New York State Agency, Mr. E. E. Higgins, manager, and will work in eastern New York. Mr. Maclilie was recently with the Hauss Electric Company in the capacity of selling agent, and will be a decided acquisition to the young and energetic agency with which he is connected.

Heath's Patent Self-Timing Speed Indicator.

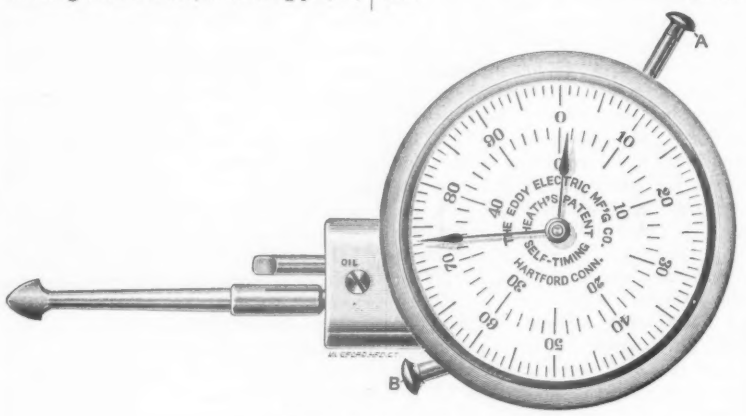
The inventor of this instrument decided to produce an indicator which would be self-timing, self-registering, and adapted to taking the highest as well as the lowest velocities. He succeeded by means of three distinct mechanisms combinable at the will of the operator.

1st. The transmitting device consists of the detachable point shown at the lower left of the cut. This point is lance-shaped at one end and is provided with a socket at the other. Two strong pinions running together, and each having a projecting shank fitting the point socket, so that a shaft running in either direction may be timed by attaching the point to the corresponding pinion. A pinion box holds these parts in proper relation to each other and with the body of the instrument.

2d. The counting and registering apparatus consists of a worm and gear, with which are connected the hands, each being provided with a heart cam, as in the case of a "fly-back" watch. There are also necessary motion wheels and pinions to secure the proper relative motion of the hands.

3d. The time mechanism includes a strong lever escapement, absolutely non-magnetic, which is operated by a spring attached to the axis of a power wheel, and this receives the same impulse, whether the speed being taken is high or low. The parts of the instrument are held between plates in a manner similar to those of a watch, and are enclosed in a neat and substantial case.

In using the indicator, the setting-pin, *A*, is firmly pressed inward until it stops, which sets the hands at 0 and winds the power spring. Then the point being attached, as in the cut, or in case the shaft runs in the direction followed by the hands of a clock to the upper pinion, the point is placed in the center of the shaft to be timed, brought as nearly as possible in line with it, and held with enough firmness to prevent slipping.



Speed Indicator.

The starting pin, *B*, is then pressed firmly inward and released; this starts the hands, and at the same time releases the time train. The instrument must now be held steadily in place until the hands stop, when the rate of speed may be read on the dial, the outer graduated circle indicating revolutions, and the inner one hundreds of revolutions.

These instruments are manufactured by the Eddy Electric Manufacturing Company of Windsor, Conn., the well-known manufacturers of dynamo-electric plating machines and electric motors.

A New Incandescent Lamp.

To the Editor of Electrical Review:

The Electrical Review correspondent at Boston had an interview of interest with a gentleman recently who has been busy in his laboratory for several months, and has produced results which are interesting the professors of various institutions in and about Boston, who are making careful and exhaustive tests of some properties of an incandescent lamp now controlled by the Standard Electric Company of Vermont, headquarters at St. Johnsbury, Vt.

The filament of the lamp is the invention of Thomas Pray, Jr., and has been perfected by him; the peculiarities claimed are non-blackening of the bulb, even if overrun very considerably, a high efficiency and long life. It is stated that the 70 volt 16 candle power lamp has been run at 100 volts for 16 hours and over with no perceptible discoloration of glass bulb, and the 50 volt 20 candle power lamps, with an efficiency of $3\frac{1}{8}$ watts per candle power, have been run on the alternating current circuit for 1,400 hours with not perceptible coloring of the bulb, and by careful tests, giving almost the same candle power at end of 1,400 hundred hours as at beginning.

But the points over which the scientific men are wondering, is the distribution of light. Whatever way the filament is placed to the photometer bar, it gives almost exactly the same amount of candle power, varying not over $\frac{1}{2}$ candle power in a 16 candle power lamp, or the horizontal; making almost a perfect circle when put in graphical form.

Exhaustive tests have been made by Prof. Holmeny, of the Institute of Technology, upon these lamps, and are being continued by him during vacation.

Two classes of lamps are being made in 50 and 70 volt, 16, 20, 25 candle power, one of about $3\frac{1}{8}$ to $3\frac{1}{4}$ watts per candle power, and one of $3\frac{5}{8}$ watts for hand usage, where electro-motive force is not constant. Several hundred per week have been made, all the present year, and arrangements are being made to produce more in quantity. Lamps of 100 and 120 volts are also made if required.

A new filament has been perfectly made by a different process, in which an efficiency of 425 to 450 candle power per E. H. P. of 746 watts is attained in a 32 candle power lamp. The carbon looks like steel, and the light is as white as an arc light. This is not on the market, but is being carefully tested for length of life. This is also the invention of Mr. Pray, and both processes are secret, being partly chemical and partly electrical in preparation.

The incandescent lamp is now in use upon various circuits, and gives pure, clear light, and is very much liked by all users. The new lamp has been shown only to a few, scientists and these who are watching it—the facts are becoming known, and the lamp is considered as high in efficiency and duration.

A. G.

Manufacturing Notes.

There will be a large number of interesting electrical exhibitions by the manufacturers during the electric light and telephone conventions.

The American Bell Telephone Company has secured 8,849 square feet of real estate at the corner of Milk and Oliver streets, upon which a building is to be erected for the headquarters of the company.

The Western Electric Company, New York, has sold during the past week over fifteen miles of underground cable for telephone and telegraph use. This cable is for underground work outside of New York City.

The Empire City Electric Company report a particularly large mail filled with orders the first days of the week, and the energetic president, Gen. O. E. Madden, and Secretary Carritt, are consequently well pleased with the way the trade for the fall business is opening. Several changes have been made by this company recently in office conveniences, that will add to the comfort of all members of the staff.

The E. S. Greeley & Co. have done a rushing business among railway telegraph men, since the adjournment of the Superintendents' Convention, their new automatic register meeting with general approval. Gen. Greeley is announced as marshal of the Connecticut clubs that will come to the city to assist in welcoming Mr. Blaine on his return from Europe, and is one of the best marshals of parades in the country.

Fostoria, O.—The Fostoria Electric Light Company; capital stock, $25,000.

Camden, N. J.—The Camden Lighting and Heating Company; capital stock, $200,000.

Chetopa, Kan.—Western Engineering and Electric Company, of Chetopa; capital stock, $2,000.

Akron, Ohio.—The Akron Electric Light and Power Company; capital $100,000. Andrew Squire and others, incorporators.

Pittsburgh, Pa.—The Duquesne Electric Light and Power Company; capital, $300,000. A. D. Armstrong and others, incorporators.

New York.—The International Portelectric Company, New York, N. Y.; capital, $100,000. Henry A. Manning and others, incorporators.

Englewood, Ill.—The Englewood Electric Light Company; capital stock, $50,000. Incorporators, Joseph Badenoch, Jr., John I. Badenoch and Charles T. Page.

Chicago, Ill.—The Foreign Patent Exporting Company, of Chicago; capital, $50,000. Incorporators, Francis W. Parker, Celeste P. Chapman and Frank M. Ireland.

Chicago, Ill.—A certificate was filed recording the change of name of the McIntosh Galvanic and Faradic Battery Company, of Chicago, to the McIntosh Battery and Optical Company.

Chicago, Ill.—The Chicago Electric Motor Company, at Chicago; capital stock, $30,000; for the manufacture of electric machinery and appliances; incorporators, R. H. Garrigne, J. C. Croggs, and H. S. Tiffany.

North Adams, Mass.—Articles of incorporation have been drawn for an electric street railway from North Adams to Blackinton, to be known as the North Adams Suburban Electric Street Railway Company.

San Francisco, Cal.—Virginia and Gold Hill Electric Light Company; capital stock, $250,000; subscribed, $625. W. E. Seil, of Berkely, A. W. Rose, Jr., of San Mateo, C. T. Bridge, N. D. Anderson, Chas. S. Wheeler, San Francisco, incorporators.

San Francisco. Cal.—The Occidental Construction Company, to operate gas, electric and water works. Directors are L. L. Bromwell and H. Wadsworth, of Oakland, George W. Lynch, of Los Gatos, John D. Yost and M. A. Newell, of San Francisco; capital stock, $500,000.

Rockland, Me.—The Highland Electric Light Company at Rockland, with a capital stock of $1,000,000; amount paid in, $1,000,000; par value of shares, $50. The stockholders are George H. Gregory, H. Gregory, Jr., Chas. A. Sylvester, Henry L. Gregory, Henry T. Beverage, Rockland; Enos T. Higham, Daniel Higham and Howard H. Higham, Philadelphia, Pa. George Gregory is president, Charles A. Sylvester, treasurer. The purposes of the corporation are to construct dynamo electric machines and other electrical apparatus.

Among the many appliances for making things lively in Chicago during the summer months, when it is at its best as a summer resort, may be mentioned the sand flies. Samples of these are now to be found in all stages of preservation on the backs of car seats, on shawls, and on seersucker coats. They leave their impression on the sidewalk, and play at tight rope walking on the ladies' head gear and spectacle bows. The electric light globes are half full every morning, and there are little winnows containing bushels in the corners and areas where the eddying wind whirls them. Forty feet circles, underneath every electric lamp, are covered with them so deep that pedestrians are in imminent danger of sitting down hurriedly, and the street gamin has made a slide as sleek and glare as if made of ice.

A Large Mather Plant.

Coronado Beach is the Long Branch of California, and is well worthy of the name. Coronado Hotel is English for the Spanish name of the grand hotel recently finished, which represents an outlay of a million of dollars, and which stands, in every respect, in the front rank of first-class hotels.

Every appliance known to constructors has been brought under subjection at the Hotel del Coronado, and among others, a large electric light plant of the Mather system has been inaugurated, a brief description of which may not be uninteresting to readers of the REVIEW.

The plant is situated in a two-story brick engine house and laundry on the shore of Glorietta Bay, just south of the hotel proper. In the basement of this building are placed the pumping and heating machinery of the hotel, as well as the five dynamos, represented in the accompanying illustration. Two of these generators have a capacity of 400 lights each, while the other three have each a capacity for 250 lights, the total capacity of the dynamos being 1,550 sixteen c. p. lights requiring current at any one time. Two Hazleton boilers are occupants of an adjoining room.

The hotel is fitted with 2,500 lamps of the Perkins type, and has thus a double plant, so to speak, it never being necessary to use even the full capacity of the generators at the same moment.

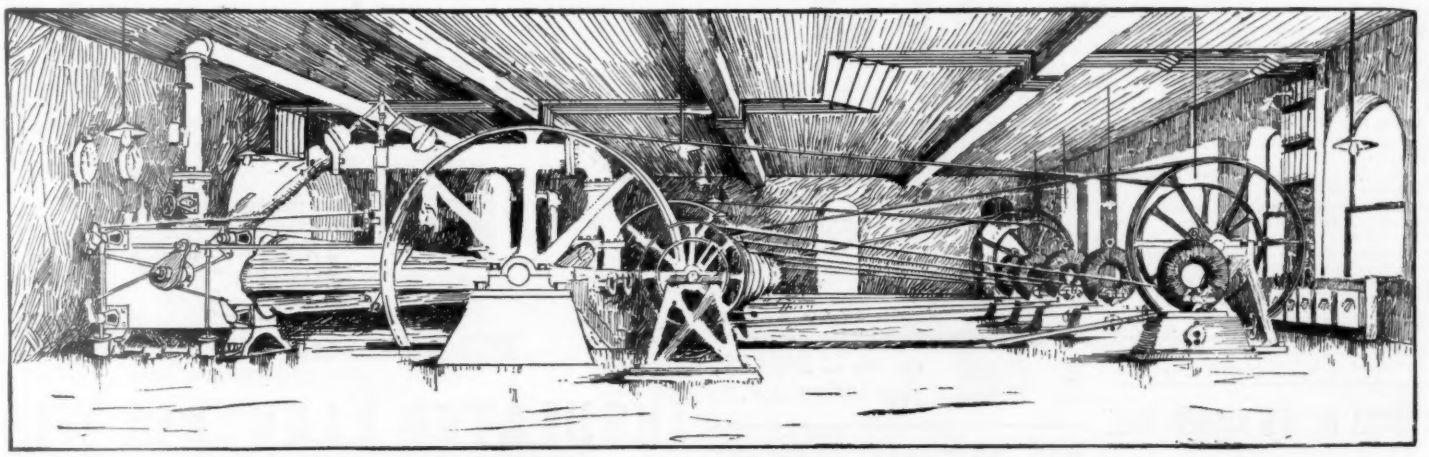
The dynamos are automatic, and it seems a matter of supreme indifference to one of these, whether it is pulling a full load or next to nothing, as the current is automatically regulated for the quantity required.

The switchboard occupies the entire wall space between two windows in this room, and is conveniently arranged so that the engineer on duty can control all the circuits with the greatest possible ease, and the controllers, one for each of the dynamos, are also within easy reach of the engineer.

From this room the wires are led along the roof of a tunnel to the hotel basement, under the breakfast room, and from there the feeders diverge, and wires multiply in number as they diminish in size, until every nook and corner of the vast structure is reached.

A second switchboard is placed in the office of the hotel, and still another in the dining room. Safety fuses are found everywhere, so that in the event of an overplus of current, the dangerous development of heat is checked by the melting of the safety device and the rupture of the circuit before mischief can occur.

Mr. W. M. Thomas, an electrician from the Chicago Mather office, of which Mr. J. H. Reid is general manager, personally supervised and arranged the Coronado plant, and is justly proud of the installation.



DYNAMO AND ENGINE ROOM OF MATHER ELECTRIC LIGHT PLANT, CORONADO HOTEL, CALIFORNIA.

Sale of the Phonograph.

It is officially announced that the phonograph business, heretofore under the control of Mr. E. T. Gilliland, general agent, has been acquired by the North American Phonograph Company, 160 and 164 Broadway, New York.

This company will control the business of the phonograph and graphophone, and is expected to most energetically develop the new and interesting field of recording and duplicating speech.

Plan of Licensing Adopted by the New England Electric Exchange.

In order to promote ambition in excellence of workmanship and extent of knowledge among men practically engaged in installing or operating electric plants, and to thus make it an object for fire underwriters to recommend the introduction of electricity in preference to other means for producing artificial illumination and power, the New England Electric Exchange, Boston, Mass., announces that it will issue licenses under the following general plan :

Licenses shall be of five classes, each class representing a certain extent of qualification.

First-class licenses shall be issued only to persons fully competent to install and operate any electric light or electric power plant.

Qualifications.—The applicant for a first-class license must be able to make working plans for central stations and for isolated installations ; must have a general knowledge of the construction of dynamo-electric machines and the electrical appliances necessary for electric light and electric power installations ; a general knowledge of the principles, construction and installation of secondary or storage batteries ; a thorough knowledge of the insurance rules pertaining to the business ; a specific knowledge of the systems operated by the applicant, and a thorough knowledge of the calculations necessary for, and the rules governing, electric wiring, and be able to make complete wiring plans. While not a requisite, a general knowledge of steam and water-power plants is desirable, and will have due weight with the examiners.

Second-class licenses shall be issued only to persons fully competent to install and operate at least two of the following plants, viz : incandescent light, arc light, or power.

Qualifications.—The applicant for a second-class license must have a general knowledge of the construction and operation of dynamo electric machines and the electrical appliances pertaining to the particular classes of apparatus it is desired to operate ; a thorough knowledge of the insurance rules pertaining to such classes of apparatus ; a thorough knowledge of the calculations necessary for, and the rules governing, electric wiring. While not requisite, a general knowledge of steam and water-power plants is desirable, and will have due weight with the examiners.

Third-class licenses shall be issued only to persons fully competent to make electric light and power installations, and who are not competent to operate electric machinery.

Qualifications.—The applicant for a third-class license must have a thorough knowledge of the calculations necessary for, and the rules governing, electric wiring, and the ability to make complete wiring plans ; a thorough knowledge of the connecting of electric light and power machinery to the wiring, and a thorough knowledge of the insurance rules governing wiring for electric light and power.

Fourth-class licenses shall be issued only to persons competent to install and operate but one of the following plants, viz : incandescent light, arc light, or power.

Qualifications.—The applicant for a fourth-class license must have a specific and thorough knowledge of the installation and operation of the class of apparatus it is desired to install and operate, together with the knowledge and ability necessary to do the wiring pertaining thereto, and a thorough knowledge of the insurance rules governing the class of apparatus to be installed and operated.

Fifth-class licenses shall be issued to persons competent only to operate electric machinery, and who are not competent to do electric wiring.

Qualifications.—The applicant for a fifth-class license must have a general knowledge of the operation of the particular electric light or electric power machinery it is desired to operate, and a thorough knowledge of the insurance rules pertaining to such machinery.

(*Where such class of apparatus is not specifically mentioned in the foregoing, "electric machinery" shall be understood to include secondary or storage batteries.*)

Any person desiring a license shall make formal application to the secretary of the Exchange, specifying the class of license desired ; these applications shall be referred by the secretary to the directors, who shall select three persons to examine the applicant and report upon his qualifications.

The examiners shall appoint for the examination such time and place as may be deemed by them advisable, and the applicant shall appear before them at such time and place for examinat'on.

The examination shall be such as to satisfy the examiners as to the fitness of the applicant for either the license applied for or for one of another class.

All licenses shall be properly filled out, with the class of the license, name and qualification of the licensee certified to by the examiners, submitted to the New England Insurance Exchange or to the Boston Fire Underwriters' Union, as the case may be, bear in token of their approval the signature of one of their inspectors, and then be dated and issued under the seal of the Exchange.

A liscense shall be valid for one year from its date, but the licensee may apply within that time for examination for a license of a higher class.

The directors of the Exchange may, for cause, revoke any license granted by the Exchange.

All applications for license must be accompanied by two dollars ($2) to help defray expenses, and must bear the signature of two members of the Exchange.

ELECTRIC LIGHT NEWS

—— The taxpayers of Ogdensburg, N. Y., have just voted $4,000 for lighting the streets of the city with electricity and gas.

—— A stock company will be organized to erect an electric light plant at Paducah, Cal. The Westinghouse system will be used.

—— D. C. Kolb, Rollin's Block, Des Moines, Iowa, wants to purchase electric light machinery and heating apparatus for a hotel.

—— The Interior Department, Washington, have purchased a Brush electric light plant at a cost of about $10,000, and are now having it erected.

—— Up in Meriden, Conn., the electrified urchin says, "You're off your trolley," while the Derby lad tells the unsteady gaited, "You're traveler's loose, Mister."

—— At Eau Claire, Wis., the city council has accepted a proposition of the Brush Electric Company of that city to light the city for five years at the rate of $110 per light.

—— A Waterhouse electric plant of 35 arc lights installed for the Whitin Machine Co., Whitinsville, Mass., was so satisfactory that the company have just ordered 135 arc lights additional from the company at Hartford, Conn.

—— The Walla Walla, Cal., Electric Light and Power Co., have elected as trustees F. J. Parker, C. Ennes, H. E. Johnson, C. E. Burrows, T. Quinn. A plant has been ordered from the American Electric Light Company.

—— The suit between the city of Mt. Vernon, Ohi, oand the Electric Light Company has been arranged satisfactorily, and the attachment on the plant has been dismissed. The town will be lighted with electricity at once.

—— The Taylor Manufacturing Co., of Chambersburg, Pa. report the following steam plants, with Beck automatic engines, as in process of construction for electric light service : Complete steam plant of four Beck automatic engines and four boilers aggregating 400 horse-power to Fort Wayne Jenney Co., for installation at Dallas, Texas ; complete steam plant, 3 engines and 3 boilers, for Fort Worth, Texas ; 67 horse-power steam plant for Gainesville, Texas ; also, two 8½x10 Beck engines to Central Trust Co., New York ; two 9½x12 engines for Pontiac, Mich ; one 12½x15 engine to go into the Gusky building, Pittsburgh, also another engine, same size, for Jones & Laughlin, Pittsburgh ; one 15x18 engine to the Edison Co., of Birmingham, Ala., being the third engine of the Beck pattern that this company have operating their stations. The Taylor Manufacturing Co. have just completed the installation of steam plant, two 9½x12 engines and boiler, at Sea Isle City, N. J., operating an Edison station. The company have also sold a number of their automatic engines for general power purposes for which they are as admirably adapted as for electric light service.

ELECTRICAL PATENTS

(Copies of any Patents in the following List will be sent to any address on receipt of twenty-five cents.)

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JULY 23, 1888.

386,463 Electric valve controller; Emil Grah, Toledo, Ohio, assignor of one-half to William Grah, Jr., same place.

386,512 Railway car; Edmond Verstraete, Chicago, Ill.

386,541 Railway signal circuit breaker; Edward B. Ives, New York, N. Y.

386,543 Compound electro-motor for electric railways; Alfred J. Jarman, London, England.

386,569 Porous cup for electric batteries; Bloomfield J. Wheelock and James W. Wheelock, New York, N. Y.

386,580 Storage battery. 386,581 Current receiver for electric railway cars; John A. Enos, Boston, assignor to William C. Otis, Nahant; E. Herbert Ingalls and Paul West, Brookline; and William E. Plummer, Newton, Mass.

386,597 Electrical call system; James C. McLaughlin, Kansas City, Mo.

386,602 Electric governor; Horace W. Parsons and John Hoduit, Wamego, Kan.

386,636 Latch opener for knitting machines; Lewis Jones, Jr., Overbrook, Pa.

386,646 Electrical typewriter; James F. McLaughlin, Philadelphia, Pa.

386,648 Inductometer; George Miot, Paris, France.

386,685 Dynamo and motor; Charles E. L. Brown, Zurich, assignor to the Werkzeng und Maschinenfabrik, Oerlikon, Oerlikon, Switzerland.

386,690 Art of splicing cable; John Collins, San Francisco, Cal.

386,729 Telegraph key; Louis Townsend and John E. Auten, Evansville, Ind.

386,754, Electro medical apparatus; John S. Muir, San Francisco, Cal.

386,767 Watchman's electric time recorder; George F. Bulen, Brooklyn, N. Y.

386,772 Electric signal or alarm; Edward Davis, Cambridge, Mass., assignor of one-half to E. B. Welch, same place.

386,775 Dynamo electric machine; Waldemar Fritsche, Berlin, Germany.

386,784 Overhead wire connection for electric railways; Walter H. Knight, New York, N. Y.

REISSUES.

10,949 Coin operated induction coil; Percy G. Williams and Alfred W. Roovers, Brooklyn, N. Y.; said Roovers assignor to said Williams.

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THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

July 25th, 1888.

The Semi-Annual Meeting of the National Electric Light Association will be held at Hotel Brunswick, New York City, August 29, 30, 31. All communications relating to this Convention to be addressed to

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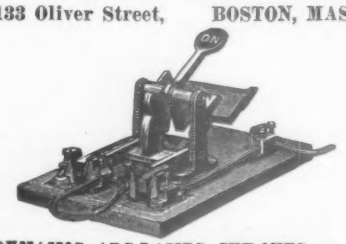

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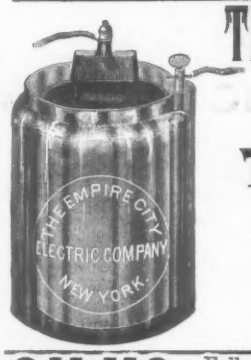

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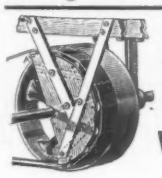

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